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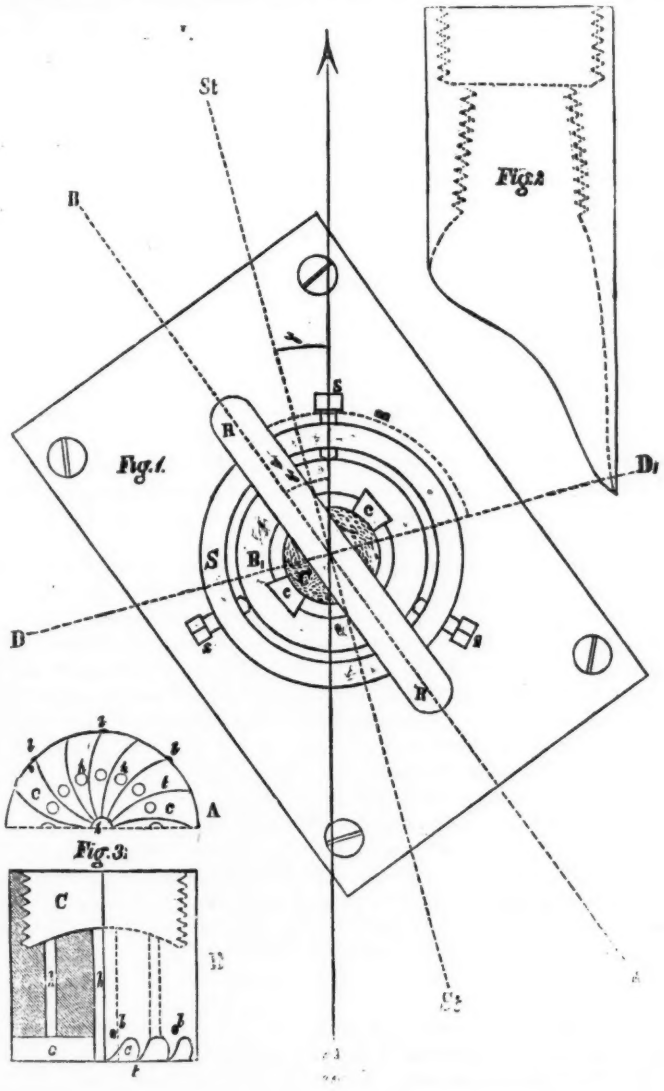
The Diamond Drill for Deep Boring, Compared With Other Systems of Boring.*

BY OSWALD J. HEINRICH, M. E.

NOTE—We are requested by Mr. HEINRICH to say that the drawings accompanying this paper are ½ the size of the tools represented, with the sole exception of the instrument used to reverse the current in the bore hole (Plate II., Fig. 3) which is ⅛ the real size.

The great improvements which have been made in late years in the different systems and instruments used to perforate the crust of the earth for purposes of testing and exploring for mineral resources or for other reasons, by means of bore holes of greater or less diameter and to greater or less depths, are manifold. It



may therefore be of interest to make an impartial comparison of them, or of such as are most commonly used.

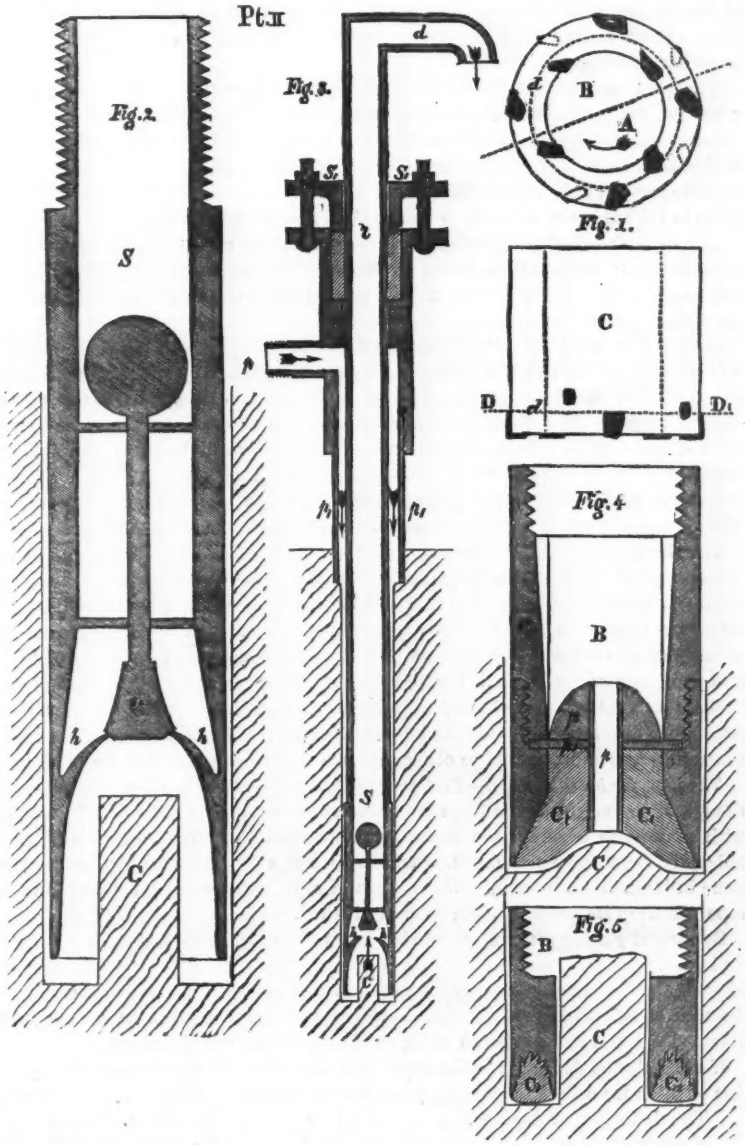
Being well aware of the difficulties which are encountered in such a task, a reasonable allowance must be made in such a comparison. It is a rare instance when even two decidedly different systems or instruments might have been used in the same locality, penetrating identically the same strata also to the same depth. The diameter of a bore hole as well as its greater or less depth must also be considered in regard to its cost per foot, etc. But for practical purposes, for exploration at least, we may assert this rule:

Any bore hole, of whatever diameter, which allows the means of examining the strata most carefully and completely, will be sufficient for this purpose, but that one which will do it most economically and in the least space of time, must be considered the best for it.

It will, therefore, partially depend upon circumstances, what system, in spite of other superiorities, may be the best in each case, and the following remarks may aid in deciding this question.

To make the attempt here to review all that has been published upon the different systems and means of boring would be out of place. Reference can be had to the able publications treating upon this subject.

A difference in this respect exists in regard to the use of the hollow rods in



connection with the diamond drill, used for that purpose. The great future, which appears to be evident for this instrument, will be warrant enough for anyone who has had the opportunity to test it, to give his experience to the public. Only in this way can we bring this system to such perfection, as it seems to deserve and demand, in order to run the race of competition with others also deserving serious consideration.

While little doubt can yet exist of its great usefulness in moderate depths, we must gradually approach the time, when, by careful use, timely improvements and proper application, it will be "*the boring tool of the future*," at least to such depths as will be sufficient in most instances in this country for exploration, say from

* A paper read before the American Institute of Mining Engineers, New York, February 26, 1874.

1200 to 1500 feet, if even no greater depth could be attained. In aid of this laudable enterprise the following remarks, the result of actual experience and careful observation, are tendered to this meeting.

The Engine and hoisting apparatus.—In all deep borings where rods or tubes are used, great delay is encountered in raising and lowering the same; in this respect, time is saved in using the cable for boring.

Being compelled to use tubes in connection with the diamond drill, the great object is, therefore, to enable us to raise them at least with such a speed as not to subject the diamond bit to unusual blows. It is, therefore, indispensable to have a hoisting drum or bobbin and pulley of good size, say from 3 to 4 feet, to use a cable strong enough to raise from 4500 to 6500 lb., or more, and to place the drum away from the boiler so as not to subject the rope to the radiant heat of the latter. Such arrangements cannot be effected in constructions where everything is crowded round, and bolted to, a movable boiler.

It will unquestionably be better to design a construction for deep boring in which the running gear for the drill as well as the hoisting gear is independent of the boiler, and not directly connected with it, as in most of the machines now sold. For the hoisting engine, the direct acting double cylinder pattern ought to be used in order to arrest or withdraw the rods at any given point, indispensable in cases of accidents as well as in cases of raising rods at a dead lift upon the starting point. For a borehole of 1,000 feet it ought to be an engine of at least 8 horse-power; for 1,500 feet, 12 horse-power if all speed is required in boring. If so constructed, a small engine upon the works may then come in handy to use for this purpose. The boiler should form a part by itself and supply both the driving and hoisting engine. It ought to be mounted on high and broad wheels attached to a substantial frame, to offer no difficulties of any consequence to removal in soft and marshy ground, the ground often selected for exploration borings. If such a construction is adopted it will be easier to move and put up each part independently and with less labor, and in case no boring is required, or none at the surface, each part may be used independently for its purpose, and may, to some extent, reduce the heavy outlay for such a machine to a more useful investment for a company.

The great weight of a line of rods for 1,000 or 1,500 feet, upwards of 4,500 to 7,000 lb., makes it also indispensable that the running gear of the drill should be firmly supported by a heavy frame down to the ground, bolted there to the foundation sills, and not bolted to a thin shell of boiler plate, as in some of the constructions. In this respect much room is left for improvements apparently very plain to the engineer, and it is to be hoped to the manufacturers also.

The Derrick.—It should be of sufficient height to raise from 30 to 40 feet of rods, certainly not less than 20 feet at one lift. Of sufficient strength and stability to sustain the weight to be raised, it need not to be quite as strong as one used for other borings, but it cannot consist in three simple poles only.

Only a few men, say two, being generally necessary to run the drill, a third will be sufficient to assist in raising the rods, if proper arrangements are made for it. This can be done by having a movable crane with wheels on top of the derrick to move the rods sideways each way upon a cross rail for the crane to run on and to hang the rods on it at the same time. This will be more advisable for tubes then to let them stand, if of such lengths as mentioned, although shorter lengths of 20 feet will stand without difficulty if supported once in the center. Here also room is left for improvement in order to gain time for boring.

The Borehouse.—The shorter time required to remain at one point, and other reasons, allow the use of a more confined and lighter construction of the bore cabin. It is best to adopt a plan in which it consists of movable frames all bolted by means of a cross stringer to four corner posts secured by iron L shaped cornerpieces to top and bottom sills. The roof is constructed in the same way, and proper openings are left, covered by shutters when not used. Boring can then go on in all seasons of the year, running day and night when in fear of a freeze. The whole construction can be placed under the derrick, and can be readily taken to pieces and removed to other places without loss of labor or material.

The Rope for hoisting rods.—Preference ought to be given to a flat wire rope, although others might be used equally well, except where it is desirable to obtain with reasonable accuracy the course of the stratification by means of one bore hole only, or, in case of a check, when three holes are used to determine the same in its medium bearing. While a round rope will twist and untwist, a flat rope will keep its position when properly loaded.

By carefully noting its line of bearing against the meridian, boring a core say six inches long, and drawing the rods carefully, this core will probably be held between the core-catcher exactly in the position it held below. When arrived at the surface, this position is carefully observed, and the true pitch of the stratum obtained. A simple calculation will give the true course of deflection.

If α denote the deflection of the rope from meridian; β the deflection of the line of pitch from the line of rope; γ the line of deflection of strata, (the strike,)

The deflection of dip line,	$\delta = \beta - \alpha$	for Fig. 1. Plate 1.
Northwest course,	$\gamma = 90 - \delta$	for northeast pitch.

The angle α will be made constant for each bore-hole by putting the derrick in the same line of deflection, if possible in the line of meridian, simplifying the calculation. By repeated observations greater accuracy will be obtained from average figures.

In practice, a firm board with movable socket s in the center, is placed below the center of rope and the bit B_1 to receive it and hold it firmly by set screws while loosing the core-barrel. Holding a straight edge in the line of dip as nearly as possible, the point D can be noted upon the board, and so the angle B measured. Plate 1, Fig. 1, represents the arrangement; RR, flat rope; C, the core; S, socket; *sss*, setscrews; B, the bit; *cc*, core-catcher; AB, line of rope. DD, line of dip; St, line of strike.

The Diamond Bit.—The great success in the diamond drill depends, of course, on the costly material used to perform its work. Too much care cannot be taken in "setting the bit." The selection of the carbons itself is a matter of importance, particularly for a very hard rock. It will appear that those which have a very rough scoria-like appearance and a brownish tint possess the most enduring qualities. In setting, if possible, they ought to set in a dovetail fashion towards the bit, and in an ascending position with the rotary motion, but opposing the most resistance in regard to the metal around it. They must also "cover each other," so as to oppose as large and complete a grinding surface as possible. The whole operation is that of the grindstone, and not of a cutting tool, differing in that respect entirely from the use of a diamond used for turning or cutting.

The illustration, Plate II. Fig. 1, will explain the setting of the bit. The side A is set right, the side B wrong. In Fig. 1 C the side D_1 is set right, the side D wrong. If the diamonds do not cover each other, grooves will be worked in the metal at the dotted lines d and d.

The actual wear in the carbons is comparatively very little, and, in spite of their high price, will, by proper care, be less than the wear in steel and charge for sharpening tools in a percussion drill. The heavy loss can only occur in losing diamonds frequently, generally from bad setting, although even with the greatest care a diamond may be lost if the metal should wear out around it before it is noticed. I have used one and the same diamond in three bits, and it perforated every inch of 826 feet of all varieties of rocks.

It is also erroneous to attempt to save in cost of carbons by not using enough of them for one bit.

We may say theoretically that too many carbons cannot be put in a bit, since the more there are the less quickly it wears. Rapid wear brings frequent risk of breaking the carbons in cutting them out of the old bit, beside the cost of setting the new one. A bit of 2 inch diameter of the annular pattern in deep boring ought never to have less than 12 carbons, and 16 will not hurt it if they should be of smaller size. A practical illustration of this subject occurred which will demonstrate the theory advanced. Bits with 8 carbons, four set upon the outside rim, four upon the inside, would wear out the metal in spite of all efforts more upon one side than upon the other. Four more small bits were set between the outside carbons higher up in the solid metal. Several hundred feet were bored in hard rock with this bit, and no unequal wear could be perceived. The demonstration appears to be plain, viz.:

A suspended rod, which the diamond drill rod represents, scarcely touching the ground, when set in rapid rotary motion by a force applied at the upper end, endeavors to describe an excentric curve (probably that of a spiral or evolvent) with its free end in the bottom of the hole. The walls of the borehole determine the limits of this curve, and consequently cause the bit to touch in its rapid motion frequently at the same point, producing a greater wear at that point. If, therefore, unequal frictional resistance is offered, the bit will wear out faster upon one point, and that the exposed metal. The motion of the bit being a very rapid one this difficulty is overcome by simply offering four more points of resistance stronger than the metal, namely, the four carbons. Care should, therefore, be taken not to apply economy in the wrong place.

Accidents in boring.—In regard to accidents in boring, so much delaying the operation when percussion drills are used, it appears the diamond drill, if not aiming to overdo the work in deep boring, is less liable to them. The loss of a diamond is the accident which will comparatively most often occur. If one should get loose, the motion of the rods, if not boring in a coarse rock or conglomerate, will indicate it at once by certain shocks. If already crushed, the dust will be washed out by the common current of water, and may even be saved in a slime box. If not crushed, and too large to pass the outside of the space (between rods and borehole), the reversed current can be applied by the arrangement proposed in the shell, Plate II, Fig. 2 and Fig. 3.

Fig. 2. The shell *S* has a valve *v* and cavities *h*; its bell-shape will allow it to pass over the core *C*, left probably always at the bottom. Fig. 3 explains the whole arrangement. The headpiece *d*, with a discharge spout, is screwed to the top of bore rod *r*. A stuffing box *S* is screwed to the stand pipe p_1. It has a pipe *p* to which the force pump is applied. The shell *S* is screwed to the lower end of rods, and lowered to within a half inch of the bottom. The water applied will take the direction of the arrows. Fig. 2 shows the shell closed; Fig. 3 the same when open.

A more simple instrument, which, in most cases, will answer the purpose of catching the diamonds, is represented in two forms in Fig. 4 and Fig. 5, Plate II. The first is adapted to the solid concave bit, and consists of an old bit, *B*, worked out conically at the lower end. The pipe is tight in the headpiece *h*. The plate p_1 is held tightly, the core-lifter C_1 preventing the tube from being forced too low, but to allow it to rise a little up in case the core is larger. It therefore plays freely in the plate *p*.

The space *c* is filled tight with a plastic mass of bees-wax, tallow and rosin, preferable to soap for deep borings, because the latter will dissolve too much by being left long in the water, which cannot be prevented in deep borings. The rods are lowered near the bottom, which is freed by washing as much as possible of fine sediment. Then the rods are set firm upon the bottom, and without turning the rods they are carefully lifted up.

Fig. 5 represents a similar instrument for the annular bit. Here a conical

groove, jagged inside to hold the composition better, is filled with the same composition c_1. The operation is the same as above. In most instances the diamonds will be found buried in the composition. If no other remedy is left, of course the lost carbon must be crushed up and washed out. But it ought to be remembered that it is not only the one carbon lost which forms an object of loss; by endeavoring to bore again without the bottom being freed of the pieces of carbon other diamonds in the bit may be ruined. Therefore no means ought to be spared to obtain those lost.

Accidents in consequence of a break or by the rods unscrewing themselves will, by proper care and watchfulness, seldom occur, except the rods should fall down the hole from great height. The little difference between the diameter of the borehole and the rods will greatly tend to serious accidents in this instance. According to the break, either the female end of a rod or a good steel tap to cut a new thread inside the rod, will mostly be sufficient to catch the rods again. If one end should be pressed in the softer side of a hole, the modified form of the "trumpet" used in other boring, can be used to straighten the rod up, and in case of the male being left in the hole will aid in screwing it on. It is represented in Pl. 1., Fig. 2, and consists of a female with a conical thread. The extension of the female forms a long-sharp edged lip, cut in the shape of a steep spiral edge. The long lip will aid in turning the rod inside the conical thread.

At all events, the complicated instruments used in percussion boring cannot be used here on account of the small diameter of the hole. In such instances the ingenuity of the engineer must be called in requisition, according to the case which is to be cured.

TO BE CONTINUED.

American Institute of Mining Engineers.

NEW YORK, FRIDAY MORNING, FEBRUARY 27, 1874.

REPORT OF PROCEEDINGS.

THE last session of the Institute was held in one of the lecture-rooms of the Columbia College School of Mines, Forty-ninth street and Fourth avenue, Prof. RAYMOND in the chair. President BARNARD, of Columbia College, welcomed the members of the Institute to the School of Mines, of which he said the exterior was so little attractive as to make the effect produced by it on the average visitor rather doubtful; but, in the present instance, he was reassured by the recollection that the gentlemen before him were members of a profession accustomed to look beneath the surface, who often found the most precious deposits where the outside was roughest. He thought they would find it so here. He did not expect them to admire the outside of this rude pile, but he knew they would appreciate the inside. The building was indeed, he said, difficult of navigation, and he trusted there would soon be provided one better suited to a School of Mines. It was not easy to get into it, but it was more difficult to get out of it. (Laughter.) The passages are dark, tortuous, and narrow, and the students were, he supposed, introduced to these passages by way of familiarizing them to the future difficulties of their profession. (Laughter.) He would be happy to conduct them through the school after they had got through with their proceedings, and he would then show them the pockets out of which had been dug many of the gems which were now adorning the profession all over the country.

Mr. JOHN M. ADAMS continued the reading of his paper on the Washoe Process.

Prof. EGLESTON remarked that the subject of poisoning in mining and metallurgical operations had been brought prominently forward at this meeting of the Institute. Mr. BLAIR had given us ammonia as an antidote to carbonic oxide, and Mr. ADAMS sweet oil as an antidote to mercurial poisoning. He thought the subject was extensive enough and important enough to justify the appointment of a committee by the Institute to investigate the matter thoroughly and report.

Mr. HEINRICH remarked that an exhaustive work had recently been published in Germany on poisoning in the arts; he thought the author's name was HIRSCH.

The PRESIDENT suggested that Professor EGLESTON write a paper on the subject, and Prof. EGLESTON replied that he would do so cheerfully if appointed a committee with authority to use the name of the Institute in collecting data.

On the motion of Mr. COXE, Prof. EGLESTON was appointed a committee of one to investigate the subject.

The PRESIDENT exhibited a sample of coke made from a mixture of anthracite and bituminous coal, half and half, in the gas coking furnace invented by Mr. W. A. SWEET of Syracuse, N.Y. The coke was very peculiar. The lumps of anthracite, presenting a graphitic, highly lustrous appearance, were firmly embedded in a matrix of ordinary coke, and the whole appeared to be sound and firm.

The PRESIDENT, in absence of the author, then read a paper on the Stamp Mills of Lake Superior, by J. F. BLANDY.

The PRESIDENT then read the following papers by title:

Silver Smelting in Chicago, by J. L. JERNEGAN.

Analyses of Furnace Gases, by Prof. T. EGLESTON.

Metallurgy of Tin at Banca, by Prof. T. EGLESTON.

Underground Transportation by Chain at Hasard Colliery, Belgium, by W. P. BLAKE.

The Mount Lincoln, Colorado, Smelting Works, by E. D. PETERS, Jr.

On the Formation of Fissures and the Origin of their Mineral Contents, by A. J. BROWN.

On the Determination of Sulphur in Pig Iron, by THOS. M. DROWN.

On certain Mechanical Changes in Bessemer Steel, by ARCH. MCMARTIN.

The PRESIDENT announced to the Institute a recommendation of the Council to appoint St. Louis as the place of holding the May meeting of the Institute. The Institute concurred with the Council, and St. Louis was formally appointed for the May meeting, subject to the discretion of the President in case of unforeseen obstacles arising.

The following resolution was offered and unanimously passed, after which the Institute adjourned:

Resolved. That the thanks of the Institute are presented to the Trustees of the Cooper Union and of Columbia College for the hospitable tender of accommodations for the meeting; to Messrs. COOPER, HEWITT & Co. and the STERLING IRON CO. for courteous invitations to visit their mines and works; to our esteemed fellow-member, Mr ABRAM S. HEWITT for the delightful entertainment offered to the Institute at Ringwood, and still more for the pleasure and cheer of his company throughout all the fatigues and exposures of that memorable excursion; to the Press of New York for kindly notices of the meeting, and particularly to the New York *Times* for its remarkably full and clear reports of the proceedings of the Institute.

Coke Ovens Compared.

MR. WILLIAM CLAPPERTON of Glasgow, Scotland, has lately made some inquiries into the workings of various sorts of coke ovens, the facts being all obtained from manufacturers, and representing the results of actual work. He found that in an English establishment 1,362 tons of coal were put into 323 bee-hive ovens, and 444 tons, 8 cwt. of hard coke and 139 tons, 1 cwt. of soft coke were obtained. The total, 583 tons, 9 cwt., is barely 43 per cent. of the coal. A Belgian manufacturer, Mr. PERROTT informed him that he obtained better results, namely 52 per cent., and Mr. CLAPPERTON therefore assumes the average performance of the bee-hive oven to be a yield of 50 per cent.

As to the Coppée ovens, Mr. VANDENKERCKHOVEN, another Belgian manufacturer, used charges of 5,000 kilogram (or 5 tons) of coal and drew 3,800 k., (or 3 tons 16 cwt.) of coke, obtaining a yield of 76 per cent. Mr. PERROTT, however, reported his return from similar ovens and coal at 70 per cent.

Mr. CLAPPERTON next compares the two systems of coking in other respects. Mr. PERROTT, who has both ovens working together, says the cost in the bee-hive is 1s. 8d. (English) per ton and 1s. in the Coppée. As to time, a bee-hive oven worked 81 cwt. of coal per week, and the Coppée worked 5,000 kilograms in 48 hours or about 175 cwt. per week. One reason for this striking difference in time is that 2½ hours are required to draw the coke and make a new charge in the bee-hive; while the Coppée is discharged and charged in 8 to 10 minutes. The difference in the labor account is very great. In regard to space, 10 bee-hive ovens cover 1,320 square feet, 10 Coppée ovens, 1,060 square feet, and 10 Appolt ovens cover 280 square feet of ground. This gives a treatment in 24 hours on 100 square feet, by the bee-hive of about 980 lb. of coal and by the Coppée of 5,190 lb., or a product per 100 square feet and 24 hours, by the bee-hive of 490 lb. coke, and by the Coppée of 3,633 lb. coke. The comparison of cost has to be made on a double basis. In England 12 bee-hive ovens would cost £540 and 12 Coppée ovens £1,248. But allowing that the 12 bee-hive ovens produce 3 tons of coke per 24 hours, 2 Coppée ovens costing £108 would do the same work.

Of course, comparisons of this kind must not be drawn too fine. But there is no doubt, that the Belgian oven is in most cases the most economical in original cost, (calculated on a given production,) running expenses and quality of product. These are advantages which must appeal to almost every manufacturer of coke and it is worth while to ask why the use of these ovens does not increase in every quarter. It is certain they have been tried in a great many districts without making that headway, which is to be expected from their great theoretical superiority. The reason for this seems to be partly prejudice, with some basis of truth. In the bee-hive oven the coal is heated entirely from above and the coke comes out in pieces, which are as long as the mass of coal was thick. In the Belgian oven, on the contrary, the coal is heated on all sides, and though the mass of coke has a columnar structure, the columns are shorter, and in breaking up the pieces are smaller. Probably this is not so economical a fuel for the iron master's use as the very large lumps from the bee-hive, which lose less in transportation, and give a more open column in the blast furnace. But the difference cannot possibly be equal to the great saving in coal, labor and time which the Coppée oven effects. In fact the defects of the coke from the Belgian oven seem to be exaggerated. It is of excellent quality and must certainly give as open a charge in the blast furnace as anthracite coal. The only real defect that has been fairly proved is the loss in small coke, and this does not seem sufficient to neutralize the economy of its manufacture.

We would be glad to receive from our readers their experience in the comparative use of these two forms of oven. In one case a number of Belgian ovens were built by an American furnace man at a cost of $500 each, and did excellent work. No complaint was made of the coke but, on the contrary, its quality was so good that the burden in the furnace was materially increased, and at the same time the return from the coal was much higher.

Deep Mining.

DEEP mining is necessarily becoming the rule in most of the older and many new mining districts. The deepest artesian boring in the world is that near Berlin, where the auger has been driven 1270 meters. The discovery of rich deposits of silver in some Bohemian mines, has led to the deepening of the shaft to 1200 meters, or 4000 feet. This is a new disproof of the vague assertion that metalliferous veins give out in depth. But it is in coal mining that the greatest developments in deep working are now taking place. In Belgium the shafts descend 100 meters (330 ft.) every 10 years, on the average, and individual mines, of course, are carried down more rapidly. One in Belgium is more than 3000 feet deep. In some remarks before the Society for the Encouragement of Material Industry, in Paris, Prof. GRUNER said that the extraction of coal throughout the world amounted to 240,000,000 tons yearly, which might be valued at 10 francs at the mine. This gives a total value for coal of $480,000 000 (gold), while all other mining products taken together do not exceed $320,000,000 in value.

THE ENGINEERING AND MINING JOURNAL.

NEW YORK, SATURDAY, APRIL 25, 1874.

ROSSITER W. RAYMOND, Ph. D., JOHN A. CHURCH, E. M., } Editors.
RICHARD P. ROTHWELL, C. E., M. E., Editor of the Coal and Iron Department.

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BY an oversight, which we hasten to correct, we printed the name of Mr. JERNEGAN, in connection with his interesting paper on the Chicago smelting works some weeks ago, as JAMES. The name should be JOSEPH L. JERNEGAN, JR. The culprit in this case, being arraigned in the sanctum, offers the contemptible excuse that he knew it was a J, and thought of course it was "not for Joseph." That young man has been in bad company.

THE American Academy of Arts and Sciences has presented a memorial to the Massachusetts Legislature asking for a new geological survey of the State. Forty years have passed since the last survey, and it is certainly time for another. We are especially glad that this application follows so close on the discussion in the Pennsylvania Legislature respecting a new survey for that State, and of which we spoke a short time ago. If by the repeated representations of scientific men the people learn that surveys are real benefits, and are looked upon as factors not only in the advancement of knowledge, but also in the material progress of communities, the advantage to science will be great. At present the feeling seems to be, that, while everything else is imperfect, progressive science alone must perform perfect works and finish them once for all as it goes along. When it is recognized that the study of our country's physical and geological features must be a constant work, and cannot be anything else, a great step will be made. The memorial presented to the Massachusetts Legislature proposes a recouping of the State for its expenses by a sale of the reports, instead of their gratuitous distribution.

THE plan suggested by Prof. THURSTON of a mechanical laboratory in connection with the Stevens Institute of Technology in Hoboken is one which deserves to succeed. In his letter to the Trustees of the Institute, Prof. THURSTON points out that the officers of railroad companies often desire to obtain dynamometric determinations of the resistance of trains and the efficiency of locomotives; to learn with precision the strength and various other important characters of materials to be employed in construction; and to ascertain the value of fuels and lubricators. Iron and steel manufacturers are desirous of obtaining thorough and accurate knowledge of the chemical constitution and physical properties of their products, and the relations which the latter bear to the former. Manufacturers of machinery and construction engineers are also directly interested in the maintenance of an impartial, competent, and thoroughly furnished tribunal which can decide intelligently, and upon conclusive experiment, what are the qualities of materials submitted. Apparently Prof. THURSTON conceives an institution like that of KIRKALDY in England, but still more extended in its applications. The Trustees of the Institute, in replying to his letter, cordially approve the plan and offer all necessary space and all facilities for investigation possessed by the Institute, so far as this can be done without interfering with the regular work of instruction. They do not feel at liberty to devote any portion of the income of the school to the maintenance of this outside laboratory; but they recognize the importance of bringing into close relation the science and industrial knowledge of the country, and promise to render every assistance consistent with their trust in the formation and maintainance of the proposed plan. Prof. THURSTON, it should be added, did not apply for pecuniary assistance, believing that there would be no difficulty in securing from business men to be benefited by the mechanical laboratory a sufficient amount of capital to provide the necessary outfit and probably, also, such an endowment as would ensure support and success. The laboratory, if established, would be supplied with most delicate instruments, the most powerful testing machines of all kinds, and a full set of dynamometric apparatus, in addition to which the extensive collections and magnificent apparatus of the Stevens Institute would leave little to be desired in the way of means.

The Quality of Copper.

IT is a well known fact that copper, as used in the arts, is by no means pure. It contains a considerable number of other elements—metallic and non-metallic—such as silver, gold, arsenic, antimony, bismuth, lead, iron, cobalt, nickel, sulphur and oxygen. The total amount of these impurities is, however, quite small, often being less than one per cent. of the metal, and while the effect of even small quantities of such substances as arsenic, antimony, and bismuth, which, being brittle in themselves, make brittle alloys, is easy to understand, chemists have never been able to decide upon the exact conditions under which the quality of copper is poor. In fact, metallurgists have discovered that comparative purity is no guarantee of good quality, since samples which the trade accepted readily as best selected, have sometimes proved to be less pure than other samples which were rated at a lower grade. Nor were the experts who made the rating in error. Metal has sometimes come out of the refining furnace which was entirely useless, but which was restored to the quality expected merely by remelting, its composition not being essentially changed. This phenomenon has remained a puzzle until now. The most that chemists were able to conjecture under the circumstances, was that the sub-oxyd of copper, which is always present, even in the best metal, played a more deteriorating part than any foreign element. It was supposed that an excess of only a few thousandths of this sub-oxyd, was sufficient to make an otherwise good metal brittle and worthless. The fact that copper could be greatly improved by merely remelting, without appreciable change of composition, was explained by supposing that a minute quantity of oxygen was removed—enough to reduce the amount of sub-oxyd to what may be called the normal or standard.

Recent investigations prove that this view is quite erroneous. Instead of oxygen being removed, the contrary is true, and it is possible for a copper, which is otherwise good, to be brittle and hard simply from a lack of oxygen. Such is the conclusion of Mr. HAMPE, a finished chemist, connected with the lead, silver and copper works of the Hartz Mountains, in Prussia. His conclusions, together with the experiments and reasonings on which they are based, are published in the *Preussische Zeitschrift* for 1873. (Vol. XXI). So far as the point which we have been discussing is concerned, we may briefly say that, according to his view, when such elements as arsenic, antimony and sulphur exist either as metal or as independent oxyds, the quality of the copper is more affected than when these substances are chemically combined with the other foreign elements, iron, lead, nickel, etc. In such combinations oxygen plays the part of a binding agent, and the addition of oxygen to a copper which is of poor quality, though pure enough, tends to neutralize the impurities by making them react upon each other. This is but a very partial statement of the conclusion reached by a long and profound course of experimental deduction.

Mr. HAMPE, among a great number of analyses, gives in the following his views in regard to the composition of two sorts of copper made at Oker, from the celebrated Rammelsberg ores. Analyses Nos. 1 and 2 are of refined copper, and No. 3 is made upon refined copper which contains an excess of sub-oxyd.

	I. Refined.	II. Refined.	III. do. with excess Cu_2O.
Cu as metal	99·1774	99·0435	93·5605
as Cu_2O	0·1476	0·3135	5·2455
Ag as metal	0·072	0·072	0·0690
An as metal	0·0001	0·0001	0·0001
As as metal	0·0467	....	....
as acid combined with other elements	0·0833	0·104	0·1020
Sb as metal	0·0331	0·0192	....
as acid	0·0619	0·0478	0·0640
Bi as oxyd	0·052	0·051	0·0480
Pb as oxyd	0·061	0·062	0·035
Fe as oxyd	0·063	0·065	0·056
Co as metal	0·0113	0·0088	0·007
as protoxyd	0·0007	0·0012	....
Ni as metal	0·0631	0·0781	0·064
as protoxyd	0·0009	0·0009	....
S as sulphurous acid	0·001	0·001	0·002
O	0·1166	0·1574	0·806
	99·9917	100·0255	100·0591
Of O there is Cu_2O	0·0186	0·0396	0·6626
SO_2	0·0010	0·0010	0·0020
in other oxyds	0·0970	0·1174	0·1414

It should be said that, in the last analysis, the condition in which the cobalt and nickel existed is unknown, the test having failed.

These analyses are very suggestive. Mr. HAMPE says of No. II; "It shows that the constitution of refined copper is entirely different from what has been sup-

posed. With exception of the silver, cobalt and nickel, the foreign metals do not exist in it in the metallic condition, or only in the smallest degree, but as acid and basic oxyds, which have united and formed salts. Antimoniate and arseniate of bismuth, lead, etc., dissolve in melted copper in the same way as cuprous oxyd and on cooling form a homogeneous alloy. Copper which contains these metals, can maintain the quality known as *refined* only so long as these combinations continue to exist. If these are changed it assumes entirely different properties.

A discovery like this may not add particularly to the existing modes of treating copper, for it comes as an explanation of facts already known, and utilized by metallurgists. But it is nevertheless of great importance. It forms but a part of a long and valuable series of investigations into the production and characteristics of copper, both as a chemical element and as an article of commerce. His results for perfectly pure copper were as follows: sp. gr. uncorrected, 8·9565, and corrected for temperature, weight of air, etc., 8·945. Atomic weight 31·6648. In regard to the latter figure he compares it with that found by BERZELIUS, 31·655 and calls attention to the wonderful accuracy with which that distinguished chemist worked, his results tallying closely with those obtained by the most painstaking methods in a very much more advanced state of the science. As to density, he finds that admixture of foreign metals expands copper. "Even a pressure of several hundred thousand pounds per square inch is insufficient to impart such a density to the copper, as it naturally assumes, when no foreign body hinders the aggregation of the molecules." Chemically pure copper has great softness and a very extraordinary toughness and malleability. Its fracture is a beautiful rosy red and its structure is perfectly homogeneous. Brittleness occurs only when slow cooling has produced crystallization, and this is completely removed by hammering.

NEW PUBLICATIONS.

A Catechism of High-Pressure or Non-Condensing Steam Engines, by STEPHEN ROPER: Philadelphia, 1874, $2.50.

We have received from Mr. Geo. W. Lord, manufacturer of Lord's Steam Boiler Cleansing Compound, the pocket-book of which the above is the title.

We turn from a perusal of this little book with a feeling of disappointment that the writer has not succeeded in doing justice to the subject. A work upon the American stationary engine is much needed; one that shall give, in plain language, the principles and rules of which so many engineers are ignorant. The writer of this treatise describes himself in the preface as an engineer of great experience, and we are inclined to think that this is the case, but he has not succeeded in expressing his ideas with sufficient accuracy to render the work useful and reliable. Many of his statements are vague and unmeaning, and are not infrequently incorrect. It would occupy more space than this work is entitled to, to attempt a critical review, making corrections on nearly every page, but it may be well to call attention to a few paragraphs, which will illustrate the nature of the statements that call for criticism. It is not a very good reason for the difference in weight of salt and fresh water, to say that "salt water is more dense," and the statement that "all fluids expand with heat, and contract with cold down to 40 deg. Fah.," is calculated to convey a false impression. A table of the temperatures of ignition of different substances gives that of steam of 100 lb. pressure, at "332 deg. Fah.," whatever that may mean. We could wish, also, that Mr. Roper, who says that the engineer "should understand the difference between longitudinal and curvilinear strains," had taken the pains to explain in what the difference consists. The author is rather severe on the slide-valve, in charging that it only "utilises about 10 per cent. of the steam-power which ought to be produced from the combustion of good fuel." We demur to the statement that "nothing approximates so nearly to perpetual motion as the instrument now in general use and known as the Injector," and find it difficult to reconcile the statement that with the injector "not a drop of water is lost, not a particle of steam wasted," with one to the effect that, "in point of economy, perhaps, the advantage would be slightly in favor of the pump." We are told that the force of gravity, is an accelerated velocity which heavy bodies acquire when falling from a state of rest," that friction, "is supposed to be the result of natural attraction," and that logarithms are "artificial numbers which stand for natural numbers."

These few examples, selected at random upon a large number marked for quotation, will give our readers a general idea of the character of the work, which will be of little value to the educated engineer, and will be positively injurious in its influence upon those who are not qualified to judge of the correctness of the statements which it contains.

We have received from HELLER AND BRIGHTLY, of Philadelphia, a copy of a new pamphlet on Engineers' Surveying Instruments, published primarily, we suppose, to advertise and illustrate the excellent instruments manufactured by this well-known house, but containing also many suggestions of interest to engineers. Among these we find in the remarks on magnetism, under the head of the Surveyor's Compass, a hint worth attention, with reference to the danger of disturbance of the needle from magnetic minerals, carried on the person. Surveyors have long been on their guard against pen-knives, watch-chains, buttons or iron rivets in the magnifier used to read graduations, but to this list must now be added the new watches in which the movements are made of nickel, which are almost as powerful in attracting the needle as if these movements were of iron; and also the "Burnside," and other new-fashioned hats, the rims of which are stiffened at the edge with a small concealed iron wire.

Messrs. HELLER and BRIGHTLY describe an ingenious method of testing plummets, which sometimes, as is well-known, by reason of internal cavities from defective casting, do not hang plumb, and may constitute in nice operations an unsuspected cause of error. The test they recommend is this: while holding the string of the plummet in the hand, to twist the string somewhat, and while the string is untwisting to lower the point of the plummet into a basin of water. If the weight is not fully distributed, and consequently the plummet not true, the eccentric motion of the steel point will scatter the water.

This pamphlet contains also interesting articles on straight line and stadia measurements and a large variety of other information. The price list of the house is appended. We notice that they now attach to their Mining Transit a second telescope on the side to be used as an eccentric theodolite, after the manner described in a paper by Prof. VINTON before the Institute of Mining Engineers. Persons owning TRAUTWINE'S *Engineer's Pocket-book* will find at the end of this pamphlet some important errata, which Mr. TRAUTWINE has taken this means of bringing to the notice of engineers.

American Handbook of Chemical and Physical apparatus, etc., being a catalogue of supplies for chemists, physicians, engineers and students, imported and for sale by E. B. BENJAMIN, 10 Barclay Street, New York. Illustrated, $1.50.

In this catalogue are contained more than 2,400 items, including of course, many duplicates, and in addition to it, the catalogue of Dr. WARD'S casts of fossils numbers 1,248 items. The variety here represented gives an excellent idea of the immense extension of accurate laboratory work, for a great number of the objects figured are special devices by distinguished chemists for carrying on delicate determinations. In addition to these are sets of apparatus for special work like that in smelting establishments, mining laboratories, assays both by the crucible and blow-pipe, collections of minerals, geological specimens and furnace models. In a prefatory notice, information is concisely given of the rules under which the business is carried on, so that purchasers may know just how their goods will be sent. A large number of illustrations are inserted and among them is an albertype of a part of Mr. BENJAMIN'S show room, and this performance is worth speaking of as a specimen of photographic printing. The first impression is that of a blurred picture, but this is to a great extent due to the great number of articles included in the picture, and to the extreme depth of the shadows. A large number of glass apparatus is shown, and with success, the principal defect being, that the camera could not distinguish between a glass beaker and any object standing behind it. The experiment is an interesting one, and shows that by specially arranging a case, very satisfactory results might be obtained, from the most complicated apparatus. Mr. BENJAMIN'S catalogue will be found a valuable handbook to all persons who have occasion to use chemical and physical apparatus.

Steel Notes.—The Bessemer Works, Joliet, Illinois.

BY R. H. TERHUNE, E. M.

I.—THE COKE EXPERIMENT.

IT has been proven by long experience that the amount of sulphur or phosphorus which is necessary to unfit Bessemer steel for general uses, is extremely limited. Twelve to fifteen one-hundredths of one per cent. is pretty generally agreed upon by engineers as this limit, and in the case of the former element, it has been alleged, that in the absence of manganese as low as five one-hundredths per cent. (.05) would seriously injure the steel. In the case of phosphorus the steel is rendered brittle when cold, or, as it is technically termed, "cold short," and is specially dangerous for railway bars, the chief use of this article of steel. Sulphur, on the contrary, produces "red shortness," causing it to break in pieces while hot, when undergoing the severe process of manipulation into blooms and rails. As in the Bessemer process these elements are not removed in any appreciable degree during the conversion of the iron into steel, or in its subsequent treatment, it is of first importance to use iron free from these substances, and then to use pure fuel in the manufacture of the steel, especially during those stages in which there is contact of fuel and iron.

The coal of northern Illinois, the most accessible to these works, and which, in part, determined their location, is extremely sulphurous, but it was hoped by this company that the crushing and washing of this bituminous coal, by a system practiced with success in Europe and some portions of this country, would sufficiently diminish the quantity of sulphur to enable them to use the coke for the manufacture of Bessemer pig iron, as well as for steel purposes. The Bérard system, as modified by Mr. ENDRES, of Pittsburgh, was adopted, in which coal slack, from its cheapness, is first crushed and screened, and then washed on a sieve in an iron tank, in which the water is kept in constant agitation by vertically acting plungers, when a fair separation of the lighter coal and the heavier slate and pyrites is effected by a difference of specific gravities, the pieces of coal being thrown out of the tank by the action of the water, when they are conveyed above by revolving chain buckets, and charged in the top of rectangular ovens, with arched tops and sliding end doors; time of coking, about 24 hours. The coke is removed from the ovens by a "pusher," mounted upon wheels operated by an engine. Several thousand bushels have been made, but the purification has been found to be imperfect, and although the ash has been brought as low as that of Pittsburgh coke, about 16 per cent, the sulphur has not been reduced below 1.76 per cent. It is very hard, but the mass is not homogeneous, much of it being too porous for blast furnace use, while with this amount of sulphur it would produce a very inferior mill iron. For heating the converters between charges, or when starting, or as a mixture with charcoal or raw bituminous

coal in the drying of ladles for steel or iron, it was found totally unfit; while in the cupola for melting iron, a trial after these results was not hazarded. It has been a costly experiment, but a valuable one to metallurgy in the West, as there is yet a hope, *from the occasional pieces of fine coke produced*, that a better means of purification may yet be obtained, and a good iron and steel-making fuel made from the vast beds in the coal fields of Illinois.

II.—REFRACTORY MATERIAL.

The converters were lined at the beginning of the campaign with English ganister, which is found to excel anything in America as yet discovered, and these linings have been maintained by "patching" over the whole surface, thus avoiding the delay of re-lining for a long time. The usual practice is to renew the entire ining after blowing between two and three hundred heats, by first removing the old lining, fixing sectional cores in the converter, and pounding the refractory material in the annular space.

The plan adopted here prevents an interruption of two or three days in relining a converter in the old way. Not fully satisfied with the Lake Superior quartz, so largely used for bottom mixtures, the company sought in Missouri a better article, and the testimony of the manager of the converting department is in favor of the material found there; it is obtained from the carboniferous conglomerate, is in the form of boulders, and contains of

Lime	0.25
Alumina	0.30
Sesquioxide of iron	20
Silica	98.50

Structurally, it is well adapted for the use, and its behavior in the Blake crusher is excellent, crushing with ease in conchoidal pieces, and causing little wear to the jaws of the machine; the fragments have a cutting edge, and are free from the granular tendencies of most quartz. This feature is of especial value where coherence is needed, as in the case of converter bottoms, where the abrasion of a mass of hot metal is to be withstood. It was proposed to obtain, by finely crushing this quartz, an angular sand for use in fire brick manufacture, with a view, as in Dinas brick, to increase the percentage of silica in the mixture.

The lime in this quartz has not been found injurious; at Johnstown it was the practice at one time to *add* a small quantity of lime. The iron is not appreciable in effect, and the alumina is an especially valuable ingredient, as it is to this that English ganister is supposed to owe much of its value.

Improved Method of Measuring in Mine Surveys.*

BY ECKLEY B. COXE.

In making surveys in the anthracite coal regions of Pennsylvania, the ordinary engineer's chain (50 or 100 ft. long) is generally used, both above and below ground. Sometimes, where it is difficult to chain, as, for instance, across a chasm, a wire is stretched from one station to the other, the distance is marked on the wire and its length is then measured with the ordinary chain. Having had occasion lately to make some surveys where it was necessary to determine with great accuracy the position of the land or property line, not only in the gangways or levels, but also in the breasts or chambers, the coal on the north side of the line belonging to one party and that on the south side to another; and as it is very difficult to measure up the breasts or slopes with accuracy, and to make the proper allowance for the pitch of the vein (the true horizontal distance being, of course, the product of the distance measured with the chain by the cosine of the angle of inclination of the chain), and as the ordinary method of chaining up or down steep slopes on the surface, by holding a portion of the chain horizontal and plumbing down from the high end, would in most cases be

* A paper read at the New York meeting of the American Institute of Mining Engineers, February 27, 1874.

TABLE I.

Station.	Angle. Right.	Angle. Left.	Reduced Angle.	Distances.	Positive Sine.	Negative Sine.	Positive Sum of Sines.	Negative Sum of Sines.	Positive Cosine.	Negative Cosine.	Positive Sum of Cosines.	Negative Sum of Cosines.
1	0°04′	....	0°04′	664.97	0.78	.....	0.78	.....	664.75	.....	664.75	....
2	0°47′	....	0°51′	711.55	10.56	.....	11.34	.....	711.47	.....	1376.22	....
3	....	0°52′	— 0°01′	408.60	.....	0.12	11.22	.....	408.16	.....	1784.38	....
4	0°33′	....	+ 0°32′	567.25	5.28	.....	16.50	.....	567.22	.....	2351.60	....
5	....	179°32′	−179°00′	186.05	.....	3.24	13 24	.....	.....	186.02	2165 58	....
B	....	31°12′	−210°12′	88 42	44.48	.....	57.48	.....	.....	76.42	2089.16	....
B1	....	19°39′	−229°51′	389.50	297.72	.....	355.46	.....	.....	251.15	1838.01	....
B2	....	9°36′	−239°27′	631.00	543.41	.....	898.87	.....	.....	320.73	1517.28	....
B3	4°06′	....	−235°21′	381.25	313.62	.....	1212.49	.....	.....	216 77	1300.51	....
B4	35°55′	....	−199°26′	752.50	250.37	.....	1462.86	.....	.....	709.63	590.88	....
B5	62°39′	....	−136°47′	294.80	.....	201.87	1260.99	.....	.....	214 84	376.04	....
5	....	9°01′	−145°48′	527.20	.....	296.33	964.66	.....	..	436.04	.....	60.00
4	86°27′	....	— 59°21′	464.85	.....	399.91	564.75	.....	236.97	.....	176.97	....
3	....	44°17′	−103°38′	210.05	.....	204.14	360.61	.....	.....	49.50	127.47	....
2	....	5°51′	−109°29′	382.2	.....	360.32	+0.29	.....	.....	127.47		
					1466.22	1465.93			2588.57	2588.57		
					+0.29				0.00			

TABLE II.

B	....	31°12′	−210°12′	88.42	44.48	.....	57.48	.....	.....	76.42	2089.16	.....
B1	....	19°39′	−229°51′	389.50	297.72	.....	355.46	.....	.....	251.15	1838 01	.....
B2	....	9°36′	−239°27′	631.00	543 41	.....	898.87	.....	.....	320.73	1517.28	.....
B3	4°06′	....	−235°21′	381.25	313.62	.....	1212.49	.....	.....	216.77	1300.51	.....
B4	35°55′	....	−199°26′	752.50	250.37	.....	1462.86	.....	.....	709.63	590 88	.....
B5	31°20′	....	−168°06′	157.90	.....	32.56	1430.30	.....	.....	154.51	436.37	.....
O.	73°10′	....	−94°57′	276.99	.....	275.96	1154.34	.....	.....	23 90	412.47	....
1	88°44′	....	− 6°13′	651.98	.....	70.60	1083.74	.....	648.29	.....	1060.76	.....
2	....	11°35′	−17°48′	157.06	.....	48.01	1035.73	.....	149.54	.....	1210.30	.....
3	6°41′	....	−11°07′	281.50	.....	54.28	981.45	.....	276.22	.....	1486.52	.....
4	8°21′	....	−2°46′	86.90	.....	4.19	977.26	.....	86 79	.....	1573.31	.....
5	....	9°26′	−12°12′	192 91	.....	40.77	936.49	.....	188.55	.....	1761.86	.....
6	....	4°31′	−16°43′	208.12	.....	59.86	876.63	.....	198.86	.....	1960.72	.....
7	2°17′	....	−14°26′	235.85	.....	58.79	817.84	.....	228.40	.....	2189.12	.....
8	....	7°35′	−21°59′	476.32	.....	178 30	639.54	.....	441.68	.....	2630.80	.....
9	4°09′	....	−17°52′	101.20	.....	31.05	608.49	.....	96.32	.....	2727.12	.....
10	....	7°56′	−25°48′	235.64	.....	102.56	505.93	.....	212.15	.....	2939.27	.....
11	18°50′	....	−6°58′	370.85	.....	44.98	460.95	.....	368.11	.....	3307.38	.....
12	....	51°46′	−58°44′	86.40	.....	73.85	387.10	.....	44.84	.....	3352.22	.....
13	....	44°30′	−103°14′	99.95	.....	97.30	289.80	.....	.....	22.88	3329.34	.....
14	....	78°51′	−182°05′	316.50	11.51	.....	301.31	.....	.....	316.30	3013.04	.....
15	14°59′	....	−167°06′	151.38	.....	33.80	267.51	.....	.....	147.56	2865.48	.....
16	13°08′	....	−153°38′	107.95	.....	47.38	220.13	.....	....	97.00	2768.48	.....
17	....	15°30′	− 169°28′	123.36	.....	22.55	197.58	.....	.....	121.29	2647.19	.....
18	....	13°15′	−182°43′	209.60	9 93	.....	207.51	.....	.....	209.37	2437.82	.....
19	....	4°40′	−187°23′	178.54	23.00	.....	230.51	.....	.....	177 65	2260.17	.....
20G	58°10′	....	−129°13′	21.91	.....	16.98	213.53	.....	.....	13.85	2246.32	.....
F	24°44′	....	−104°29′	173.71	.....	167.56	45.97	.....	.....	43.44	2202.88	.....
E	34°10′	....	−70°19′	79.82	.....	73.79	.....	27.82	26.39	.....	2229.27	.....
D	21°59′	....	−48°20′	9.08	.....	6 78	.....	34.60	6.04	.....	2235.31	.....
C	....	19°08′	−67°28′	25.95	.....	23.97	.....	58.57	9.94	.....	2245.25	.....
A	....	154°46′	−222°14′	106.80	71.81	.....	13.24	.....	.....	97.05	2166.20	.....
B	43°15′	....	....	....							0.62	.....
					1565.85	1565 87		0.02	2982.12	2981.50		
					Difference—0 02			Difference + 0.62				

very difficult and dangerous, and sometimes impracticable, I determined to adopt a new plan which would do away with most of the above difficulties, and by which I could eliminate many causes of error from my ordinary chaining.

My first idea was to have a fine steel wire rope, about 300 ft. long, stretched as much as possible in making, so as to do away as well as I could with that source of error, and then to have it graduated every ten feet. I proposed using small brass tags of different shapes to designate the different hundred feet thus :

0—100 a triangle.
100—200 a square.
200—300 a circle, etc.

The numbers of the the ten feet spaces were to be marked by drilling small holes in the tags. I intended to use this for the principal lines of my surveys and to use the chain only for lines which were not of great importance.

When I called upon Mr. HELLER (of HELLER & BRIGHTLY, the instrument makers, of Philadelphia) to order this measure, he suggested that it would be better to use instead of a wire rope, which would stretch, the bands which are manufactured for hoop skirts ; they are made of tempered steel, are very light, and will not stretch sensibly. After consultation with him, I decided to have the tape measure constructed which is now before you. It is 500 ft. long and weights 2 lb. 7½ oz. It is a ribbon of tempered steel, 0.08 inch wide, 0.015 inch thick. At each 10 feet a small piece of brass wire is soldered across the tape, the solder, which is white, extending about one inch on each side of the wire. In the latter, a small notch is filed, which marks the exact point where the ten feet ends. The exact distances from the zero point of the tape are marked upon the solder by countersunk figures. The white solder enables one to find the ten feet notches very easily, and, no matter how dirty the tape may be, by wiping off the solder with the finger, the distances are easily read, as the countersunk figures, being filled with dirt, stand out upon the white ground of the solder. The 0 and 500 feet marks are not at the end of the tape, but near it, and are also denoted by a notch filed in a wire soldered to the tape.

The tape is wound upon a simple wooden reel, ten inches in diameter, which is held in one hand and turned by the other. At first some difficulty is experienced in winding up the tape, but a little practice soon overcomes it. Two brass handles, which can be detached, accompany the tape and are carried upon the reel.

Description of a survey made with the tape.—The instruments used were one of HELLER & BRIGHTLY'S new 12 inch transits, 2 plummet lamps, the 500 ft. tape and a 5 ft. wooden rod divided into feet and tenths. The latter is used to measure the distance from the nearest ten feet to the station. There were two closed sets of lines or surveys, one set entirely above ground, but through the swamps and brush of the anthracite coal region, and one partly above ground and partly in the mines. The latter began at a point in the swamp, went overground 2400.57 ft. to the mouth of the slope, then down the slope (pitch 37 deg.), 276.99 ft. (horizontal distance), then along the gangway 4272.01 ft., which formed one-half of the ellipse, then up through a breast (pitch about 34 deg.) 275.44 ft (horizontal distance) to the bottom of an air shaft, then by two plumb lines to the surface, and then through the swamp 141.83 ft. on the surface to the point of beginning. The length of the periphery of the first closed figure was 6660.19 ft.; that of the second 7,366.84 ft. Tables I. and II. on the preceding page show the details and calculations of the two surveys :

From these we see that the total errors were in the

	Sine.	Cosine.
First case	+0.29	0.00
Second case	−0.02	+0.62

This is very accurate work, for this kind of mine surveying. We made three other surveys on the same property with equally good results.

In measuring with the tape it is better to have at least three men, one at each end and one to take off the distances and note them. The hind chainman should be a reliable man, as he must hold the zero point of the tape exactly at the nail in the stake, or alongside of the cord to which the plummet lamp is suspended. The front chainman has merely to stretch the tape and to see that it passes exactly over the front station. The third man, who carries the five foot rod, starts from the rear station and notes the distances of the breasts, etc., as he goes along until he arrives at the forward end, where he notes the distance of the station from the last one. In measuring distances of over 500 feet, a temporary station is made at 500 feet exactly in the line to be measured.

Advantages of the tape.—First, greater facility in measuring up or down slopes, breasts, etc. Second, greater accuracy in measuring from one station to another, as the tape forms a straight line from one station to another, and as there is no error from the use of pins. Third, the tape does not stretch appreciably.

Disadvantages—First, It is liable to break unless carefully handled. Second, It is necessary to roll it up and unroll it when the distances between stations vary much.

The tape can be easily mended by any watchmaker when it breaks, and Messrs. HELLER & BRIGHTLY make a small sleeve of brass, tinned inside, in which the ends of the tape, when broken, are slipped and then soldered fast by merely heating the sleeve with a red hot poker. They also have little brass clamps to fasten on the tape to mark any point, which is to be used several times.

When the men become accustomed to the tape they wind it up and unwind it very quickly.

There are three sources of error which may be referred to, viz.:

I. The extension of the tape by stretching.

II. The shortening of the tape in consequence of the tape assuming the form of the catenary curve.

III. The contraction or expansion due to the change of temperature.

As stated above, the tape does not stretch appreciably, but this error being in the opposite direction is, to a certain extent, compensated for by the shortening due to the formation of the catenary curve by the tape. I subjoin a table, calculated by my assistant, Mr. EDGAR KUDLICH, showing the shortening of the tape due to the latter cause. The tension in practice is from 30 to 40 pounds.

TABLE III.

True distance when the tape is subjected to a tension of, (or chord of the catenary curve formed by the tape.)

Length of Tape Measure.	10 lb.	20 lb.	30 lb.	40 lb.	50 lb.	60 lb.
100 ft.....	99.9894	99.9974	99.9988	99.9993	99.9995	99.9997
200 ft.....	199.9153	199.9791	199.9907	199.9948	199.9967	199.9977
300 ft.....	299.7143	299.9294	299.9687	299.9824	299.9887	299.9922
400 ft.....	399.3228	399.8327	399.9260	399.9583	399.9733	399.9815
500 ft.....	498.6775	499.6732	499 8551	499.9185	499.9479	499.9638

According to the table given by HASWELL for the expansion of steel, a tape measure 500 feet long at 32° Fahr., would become 500.6 feet long at 212° so that a variation of 60° in temperature would only cause a variation of two-tenths of a foot in a 500 feet tape.

In conclusion I would advise the use of the tape for all important work, while the chain should be used for filling in details, and where accuracy is not absolutely necessary.

DISCUSSION.

Mr. COXE remarked in answer to questions that no correction was applied for temperature, and no allowance for stretching of the wire ribbon. He thought its extension was practically *nil*.

Mr. RAYMOND commented on the fact that, while mining and surveying instruments of all kinds had been improved so much in recent years as regards accuracy and precision, the method of measuring distances—the chain—had remained the same. Nothing could be inherently more objectionable as a standard of measurement than a chain, composed of links which are liable to wear by friction.

COAL TRADE REVIEW.

NEW YORK, April 24, 1874.

There has been little change in the condition of the Anthracite trade during the past week; some of the companies report an active market, but, in general, the sales are not up to the expectations or wishes of the dealers. The movement of coal indicates a revival in our manufacturing interests; but notwithstanding the President's Veto of the currency bill, there is still a disinclination among our capitalists to make permanent investments, and a general feeling of uncertainty as to the future which will prevent any great revival in our manufacturing interests.

An advance of 10 cents per ton for May prices has been decreed, as per programme, on coal sent to competitive points by the six companies. There is also to be a reduction of 15 per cent. from the quota to be mined by each of the companies during the month of May. The large stocks on hand at all the shipping ports show the necessity for this measure.

The Delaware & Hudson Canal Company and the Pennsylvania Coal Company have united in establishing an agency in this city "to facilitate the transaction of business with parties requiring coal east of Honesdale and Hawley, along the line of the Erie Railway and its branches." The prices of the Lackawanna and Pittston coals will be the same, and the companies accept orders only upon the condition that they may be filled with the coal of either or both companies at the option of the agent, and as the exigencies of the business of the companies seem to require. Mr. F. S. Hoyt, of Trinity Building, has been appointed agent.

The Delaware, Lackawanna & Western R. R. Co. advertise the usual auction sale of Scranton coal. Only 50,000 tons are offered, indicating, apparently, that the Company is now selling a large portion of its coal at private sale.

The very low rates of freights which, in the early part of the week, were $1.55 and $1.60 to Boston, and now can be taken at $1.65 to $1.75, have induced some parties to lay in stocks and have given a temporary activity to the movement of coal not in accordance with the demand for immediate use.

Production of Coal for the Week Ending April 18.

There was mined in the Lehigh Region for the week	85,346 tons.
In the Wyoming Region	204,480 "
" Schuylkill	145,430 "
Sullivan Region	541 "
Total anthracite mined for the week, exclusive of a portion of the colliery consumption	435,797 "

CUMBERLAND REGION.

Mined for the week	54,930 tons.
Corresponding week last year	57,708 "
Decrease	2,778 "
Mined for the year 1874 to 18th April	426,562 tons.
Corresponding period 1873	519,477 "
Decrease	92,915 "

For the coal mined on the the line of the Pennsylvania R. R. and branches for the week ending 11th April, the details are given in another place.

Receipts of Provincial coals at New York for the week: 224 tons.

Receipts of Coal at Tide Water at Port Richmond.

The receipts for the week ending April 18th were 42,000 tons, shipments 50,000. Balance on hand is given as 96,000 tons, This is merely a rough estimate and appears to be much below the actual amount, judging from previous reports.

AT COAL PORT.

Receipts for the week	9,365 tons
" " year	37,549 "
Shipments for the week	9,217 "
" " year	33,421 "

AT SOUTH AMBOY.

Receipts for the week	17,085 tons
" " year	215,950 "
Shipments for the week	11,121 "
" " year	158,959 "

The total amount of anthracite coal carried by the Belvedere Div. P. R. R. for the week ending 18th April, was 33,258 tons, being the largest tonnage this road has ever had in a single week.

Bituminous Coal.

There has been considerable activity during the past week in bituminous coal. There appears to be a warm strife between the companies for the trade, and much "cutting under" on prices. Some parties, endeavoring to secure new customers, are offering their coal at figures that leave little or no profit to

the coal owner, while those who otherwise are unwilling to sacrifice the coal, are obliged to put the prices down to the lowest offer or lose their old customers. We consequently learn of sales of best Cumberland coal at Georgetown at $4.35, and possibly even less. With the very low freights at present prevailing, there is an excellent opportunity to build up a foreign trade that will take a portion of our surplus, and leave a reasonable profit on mining these coals. It is evident the consumer is now master of the situation, and can command nearly his own price, but this competition between the Cumberland companies will certainly end, as did the competition among the Anthracite miners, in a consolidation or combination which will "regulate" the trade and keep the price of coal above its present figure. We do not say that any such combination is at present under consideration; on the contrary, the competition has but just begun, and we may see still lower prices, with possibly some failures and some strikes among the workmen, for their wages must come down with the selling price of coal, before these causes produce the same effect they did in the anthracite trade.

Cumberland Coals.

We note sales of 40,000 tons Cumberland coal to Weymouth, Wareham, Providence, Sommerset and Deighton, terms not transpired but supposed to be in some instances at prices delivered, based on $4.35 f. o. b. at Georgetown, and generally not exceeding $4.40.

Other sales of about 50,000 tons, in lots of 2,000 and upwards, of Cumberland coals, mostly to eastern ports, are reported for the week, at prices equally favorable to the purchaser.

We record the sale of 5,000 tons for Havana from Baltimore, and large consignments to San Francisco. Freights from Baltimore to Havana can be taken at $2.50; and we hear of offers of Cumberland coal to be delivered in that port at $7.25, American currency. A few weeks ago we gave quotations of coal in Havana in January at $13.00, and at Matanzas $15.00, we should have added "Spanish currency."

Freights from Georgetown to Havana are from $3 to $3.50, and vary from day to day.

To San Francisco from Baltimore, $9.00@$10.00. Same time last year they were $15.00.

Kanawha Coals.

We note a sale of 1,000 tons of Cannelton cannel for shipment to New Haven at $11, f. o. b. at Richmond, Va.

Also one cargo of Cannelton splint to arrive, on private terms.

Foreign Coals.

We record the sale of a cargo of 800 tons of Hartlepool (Newcastle) coal in port at $6 00 per ton, also, say, 3,000 tons Newcastle to arrive, of which 1,500 tons were sold at $7 45, and 1,500 tons at $7 25, delivered at wharf here.

The first importation of Provincial coal this year came to hand on the 18th inst, by the brig Henry Perkins, from Halifax. This vessel brings the first cargo of coal shipped to the States from the Spring Hill Colliery, Cumberland County, Nova Scotia. We have some interesting points relative to this colliery which we shall lay before our readers at an early date. The cargo just received is a sample cargo for gas manufacture, it being the intention of the company to compete for a share of the large trade in gas coals in the States, their proximity to these markets affording them special advantages of water transportation over other and more distant provincial coal ports.

The Bituminous Coal Trade of Philadelphia.—The bituminous coal trade in this market is dull and inactive, with little prospect of an early improvement.

To the stagnation in the iron manufacturing business may be attributed this unusual depression at this season of the year, and until its revival the operators must continue to accept low prices and a small production.

The Clearfield County bituminous coals are fast absorbing this market and rapidly gaining favor for shipment to Eastern ports and the West Indies, in competition with the Maryland coals, which for so many years have monopolized that trade.

This is a new region of large area, capable of an extensive production, while the quality of the coal is such as to class it amongst the most popular steam generators.

Several large sales of these coals have been made on private terms.

The Red Star Line (Antwerp) have contracted for the Kittanning Company's coal of that name. The American (Liverpool) Line purchased Berwind & Bradley's "Sterling" coal.

Shipments to the West Indies have been quite large, but the season is now drawing to a close.

Current prices may be quoted :—Broad Top, Clearfield and Alleghany coals in cars at mines, $1 25 to $1 40 per ton of 2,000 lb., according to quality.

FOR SHIPMENT AT GREENWICH F.O.B.
Per ton of 2,240 lb.

Kittanning Clearfield	$4 75 to $5 00		
Sterling do.	do.	According to destination	
Decatur do.	do.		
White & Single do.	do.		
Morrisdale do.	do.		

FOR SHIPMENT AT PORT RICHMOND.

Broad Top coal..... $4 75 to $5 00, according to destination.

Arrangements for the shipment at Amboy of Clearfield and other Pennsylvania soft coals are in progress. A large pier recently erected will afford excellent facilities therefor.

Clearfield coals may be quoted at $6 25 per 2,240 lb. at Amboy f.o.b.

The Anthracite Coal Trade of Philadelphia.—Unusually low freights, particularly at this season of the year, continue to rule and to create increased activity in the shipments. From $2 10 to $2 25, according to size of vessel, is the rate to Boston, and to other points corresponding concessions are made.

The first steam collier which the Reading Railroad Company has had completed since 1870—the steamer Reading—was loaded last week, and carried 1,502 tons to Boston, making a very quick passage. It is the pioneer of six steamers of that size built by Messrs. Cramp & Sons. Two more have been under way for a considerable time at Chester, and are progressing slowly. There has been so much said in the newspapers about the large fleet of steam colliers of that company that it is proper a correct list of them should be given. In 1869 the steamers Rattlesnake and Centipede, each carrying 500 tons, were finished; the Leopard and Panther, 800 tons each, and Hercules and Achilles 1,000 tons each, were finished in 1870. The steamer Reading, finished last week, is therefore the seventh.

We notice that the reports of coal received, shipped and on hand at Port Richmond continue to show great discrepancies, but are admitted officially to be rough estimates. As other companies give correct accounts of their receipts at tide water you ought to divide your statements in two classes, 1st., correct returns; 2d, *rough estimates*, not to be depended upon.

Circulars of prices on board for May show the advance of 10 cents per ton on every size, as arranged last winter. For the city and line trade there is also an advance on Schuylkill coal of 10 cents on broken and egg, and 15 cents on stove and chestnut, making prices in cars at Port Carbon—lump and steamboat, $2 75; broken, $2 85; egg, $3; stove, $3 16; chestnut, $2 40; pea, $1 25. In the meantime the Council of Six has ordered a curtailment of 15 per cent. to competitive points from tide water for the month of May, which experience has taught, to the Schuylkill Region means about 50 per cent to all points. To reconcile a steady advance in prices with a forced reduction of the production is a feat which can only be done by the new school of economists at present so industriously and successfully engaged in running the anthracite coal trade. The advance on board at tide water was preordained and therefore *it had to be so*. The advance to consumers and dealers on the line and in the city is a mere experiment, was uncalled for at this time and unexpected. The motive which prompted it can no more be explained than the reason for the decline on March 1st., when no one expected it. The *secret* committees who fix those matters are like children with a new toy and trying to see how far they can go.

Mr. E. F. LOISEAU has sold the right to manufacture artificial fuel under his patents in England for the sum of £12,000 sterling and a royalty of 1s. per ton on all the fuel made, when coal sells at from 15s to 25s. per ton in London; as the price of coal goes up or down from these figures, the royalty varies proportionately. The purchasers agree to manufacture a minimum amount of 100,000 tons the first year, and after that to keep the market supplied, on failure of which the vender can manufacture himself.

We congratulate Mr. LOISEAU on so satisfactory an arrangement, and have the greater satisfaction in announcing it, as he informs us that the negotiations which have resulted so favorably were in the first place brought about by the publication and endorsement in the ENGINEERING AND MINING JOURNAL of a description of his method of manufacture.

Mr. LOISEAU is organizing a very strong company to carry on the manufacture of his patent fuel in this country.

Quick Work Shaft Sinking.

The Riverside Coal Company have just put down a shaft, at their Wyoming Colliery, near Wilkesbarre, Pa., to the Baltimore vein. The shaft is 251 feet in depth; of this the lower 211 feet were sunk in less than four months, the quickest work we have heard of in our anthracite measures. The drilling was done by hand, the shots fired by electricity. Dimensions of shaft 12x20. The rock is a consistent and, in some beds, very hard sandstone, with some beds of shale, hard enough to stand well; but little water was met with. The coal proves of the same quality as found in the adjoining collieries; the upper bench (the lower has not yet been reached) is 11 feet in thickness.

WM. MCCULLOCH formerly the mine boss of the Riverside Coal Co., was the contractor for the work, at a figure, we understand, less than $200 per yard.

The Spring Mountain Coal Company has leased its collieries in the Beaver Meadow Basin to the Lehigh Valley Railroad Company for ten years. The lessee agrees to pay, as rental, seven per cent. on the capital stock ($1,500,000) of the coal company.

THE BRITISH COAL TRADE.

LONDON, April 4, 1874.

Although the prices of coal are very low in some districts, yet we still learn of reductions taking place in others, and the necessity of still further reducing them in many cases. The labor troubles in the South Staffordshire district are rather serious, there being about 17,000 men on strike. At a meeting of the coal owners at Birmingham on the 27th ult., they refused to meet the workmen's agents, saying they were always willing to meet the men, but never considered the agents as working miners, but simply paid agitators, who employ their time raising contentions between employers and the employed. The masters speak confidently as to the termination of the strike, and point to the fact that in every previous struggle the men have after a period of enforced idleness, and some privation, been obliged to give way and come back at their terms. There is no doubt that the more intelligent miners see that the proposed reduction is inevitable, and that owners can not permit them to resume work until they accept their terms. In fact, it is rather doubtful if the proposed reduction will be sufficient in many cases. In some districts prices of coal are nearly as low as at the beginning of 1872, while the wages are from 30 to 60 per cent. higher, and all other working expenses proportionately so. The new Miners' Regulation Act has greatly increased the cost of "getting," so that if coal should again fall to where it stood previous to the beginning of the late advances, the miners could not receive so large wages as they then did. As matters are much the same in nearly all districts, the miners cannot migrate, and they may as well remain where they are, and abide the results.

As the general depression is so plainly observable to all in the North of England, there are no apprehensions of trouble from the proposed reduction of wages. A meeting of 6,000 North Staffordshire miners was held at Hanley, when, by a large majority, it was resolved to accept 10 per cent. reduction—the owners having met the men half way. It is understood, that in the Forest of Dean district the more expensive workings will be discontinued during the low prices of coals, which will necessitate the discharge of a large number of men.

Reports from Newcastle-on-Tyne state that coke of good second-class quality can be had at 17s.@18s. Our Darlington reports say that the same quality can be purchased as low as 18s. In the Wigan district, best house coals at the pit mouth are worth 16s.@16s.6d.; seconds, 14s.; and common qualities, of coal, about 12s. At Earl Dudley's collieries best coals are quoted at 18s.6d.@20s. The Cannock Chase Railway Colliery Co. quote coals 12s.@15s.; and Cannel gas coal, at 40s.

Wales.—Matters are rather quite in Wales, and prices have not materially changed. Prices have receded from 3s. to 5s. from top quotations some few months since, and should the strike in the tin plate trade continue for any length of time, and the depression in the iron trade exist, prices must still further recede, and the output be materially reduced. The coal owners have postponed the consideration of the latter question until the latter end of this month, so that we are not likely to hear of any trouble from that source until after their decision is heard. There is a fair export demand, and steam coal is in fair request. Households are very dull and prices weak. Best steam coals are quoted at 20s.@21s. f. o. b.

Scotland.—In the Fife and Clackmannan districts the men are working more steadily than before the reduction in wages came into effect. Everything indicates that there will be a further reduction in these districts of both prices and wages before long; indeed, there has already been a reduction of 6d. in the price of coals at some of the collieries. The Mid-and East Lothian strike against a reduction of 1s. per day on the rate of wages has fairly collapsed, and the men admit that they have been beaten.

In the West of Scotland the settlement of the labor question appears to be further off than at the date of our last. A sliding scale will undoubtedly be accepted, provided a basis can be determined upon; but it is alleged, that in the coal districts Mr. FERRIE's proposition would involve, in some cases, a reduction in wages amounting to 3s. per day, and in others to 25 per cent.

The following are the quotations in the West of Scotland, on trucks at the pit: Household coal, 13s.6d @14s.; steam coal, 10s.6d.@12s.; small coal, 8s. The following are the quotations f. o. b. at Glasgow Harbor cranes: Wishaw main coal, 12s.6d.@13s.6d; house coal, 16s.@17s.6d.; splint coal, 13s.6d,@ 14s.9d.; and steam coal. 15s.@17s.

Ireland.—In Ireland they are beginning to reap the benefits of the recent declines in coal in England and Scotland. As regards the successful introduction of home produce, no very favorable accounts can be had. In some two or three districts, the workings are productive, and a fair amount of coal is realised and sold; but this coal is nearly all consumed in the vicinity of the mines, little of it ever reaching the Metropolitan or other markets.

COAL PRODUCTION.

Anthracite.

Mined for the week ending April 18, 1874.

	WEEK. tons.	YEAR.* tons.
Wyoming Region.		
Delaware and Hudson Canal Co	58,158	663,638
Delaware, Lackawanna and Western RR.	56,053	662,924
Pennsylvania Coal Co	27,791	319,204
Lehigh Valley R.R	25,187	291,484
Pennsylvania and New York Railroad	3,407	18,208
Central Railroad of New Jersey	33,884	316,990
Lehigh Region		
Lehigh Valley Railroad	65,343	810,454
Central Railroad of New Jersey	20,003	200,704
†Danville, Hazleton, and W. B. R.R	....	4,137
Schuylkill Region.		
Philadelphia and Reading Railroad	129,457	1,098,272
Shamokin and Lykens Valley	15,973	145,953
Sullivan Region.		
Sullivan and Erie Railroad	541	6,702
Total	435,797	4,538,670

* Year beginning January 1st.
† From the Penn.R.R. Co.'s report, April 11.

Bituminous.

Mined for the Week Ending April 18.

	Week. Tons.	Year. Tons.
Cumberland and Pennsylvania R.R	48,810	385,295
Cumberland Branch R.R.....	6,120	41,277
Barclay R.R.....	6,199	51,943
Huntingdon & Broad Top R.R.....	5,167	111,537
†Snow Shoe.....	....	19,389
†Tyrone and Clearfield.....	....	166,994
†Allegheny Region, Penn. R. R.....	...	65,813
†West Penn. R.R.....	....	62,277
†Southwest Penn. R.R.....	....	939
†Gas Coal, Penn. R.R	....	190,755
†Pittsburgh coal, Penn. R.R.....	....	99,849

Coke.

†Tyrone and Clearfield.....	....	124
†Allegheny Region, Penn. R.R.....	....	*35
†West Penn. R.R.....	....	15,157
†Southwest Penn. R.R	....	108,246
†Gas Coal, Penn R.R.	....	11,348
†Pittsburgh Coal, Penn. R.R.....	....	28,103

†From Penn. R.R. Co's. report for week ending April 11.

MARKET PRICES OF COAL.

Import Duty on Coal.

Anthracite free. Bituminous, per ton of 28 bushels, 80 lb. o the bushel, 75c., gold.

All slack, or culm, such as will pass through a half-inch screen, per ton of 28 bushels, 80 lb. per bushel, 40c., gold.

Not otherwise provided for, per ton, 40c., gold.

ANTHRACITE.

WHOLESALE PRICES FOR APRIL, ¶ F. O. B. AT SHIPPING PORTS.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
‡Scranton at E'port & Hoboken	4 60	4 70	4 80	4 95	5 40	4 40
*Lackawanna	4 60	4 70	4 80	4 95	5 40	4 40
§Pittston at Newburgh	4 30	4 30	4 40	4 50	5 00	4 15
Wilkesbarre at Port Johnston..	4 60	4 70	4 80	4 95	5 40	4 40
Newport and Plymouth.....	....	...	4 80	4 95	5 60	4 40
Susquehanna Coal Co.at Amboy	4 75	4 85	4 90	5 05	5 50	4 50
Kingston at Hoboken.....	4 60	4 70	4 80	4 95	5 40	4 40
Lehigh Coals.						
Old Company at Port Johnston.	5 55	....	5 50	5 50	5 40	4 40
Old Company's Room Run.....	5 05	....	5 05	5 05	5 65	4 70
Sugar Loaf at Port Johnston...	5 55	....	5 50	5 50	5 50	4 55
Hazleton at Elizabethport.....	5 40	....	5 35	5 35	5 50	4 55
Honey Brook at Elizabethport..	5 40	....	5 35	5 35	5 50	4 55
Spring Mt. C. Co. at Hoboken..	5 40	5 40	5 35	5 35	5 65	4 70
Beaver Meadow at South Amboy	5 55	....	5 50	5 50	5 50	4 55
McNeal at Port Johnston	5 40	5 40	5 35	5 35	4 90	3 55
Schuylkill Coals at Port Richmond.						
Schuylkill White Ash	4 10	4 20	4 30	4 45	4 90	3 80
Schuylkill Red Ash.....	....	....	4 45	4 60	4 90	4 05
Shamokin W. and R. Ash.....	....	....	4 55	4 90	4 90	3 80
N. Franklin.....	...	....	4 90	4 90	5 05	4 05
Lorberry	....	....	5 05	5 05	5 80	4 55
Lykens Valley	....	....	....	5 80	5 60	4 50

* f. o. b. in New York Harbor.

§These are net prices for delivery, during April, of coal previously contracted for, and are not rates at which the company would now make contracts.

‡ These prices are for registered contracts. Buyers not having contracts will be charged 15 cents per ton more than above prices.

Scranton sale, March 25th, averages: Steamer, $4 50; grate, $4 59¼; egg, $4 82½; stove, $5 25; chestnut, $4 24.

¶ Prices for May as per circulars dated the 20th inst., are 10 cents per ton above these rates.

Line Prices for April, 1874.

WHOLESALE.

At	Lump and Broken.	Egg.	Stove.	Chestnut.	Pea.
Carbondale.....	2 25	2 25	2 50	2 00	1 25
Fair Haven, Vt.....	6 00	6 25	6 50	6 25	....
Ithaca, New York.....	4 90	4 90	5 40	5 15	....
Mauch Chunk, Lehigh coal.....	3 35	3 35	3 60	3 10	....
" Newport coal.....	2 25	2 25	3 50	3 00	....
" Wilkes-Barre coal.....	3 50	3 50	3 70	3 20	....
Pittston Junction.....	2 45	2 45	2 70	2 45	....
Port Carbon.....	2 75	3 00	3 15	2 40	1 25
Port Clinton.....	2 91	3 09	3 19	2 44	1 44
Schuylkill Haven	2 83	2 98	3 08	2 33	1 33
Scranton.....	2 25	2 25	2 50	....	1 25
Wilkes-Barre	2 25	2 25	2 50	2 00	1 25
Waverly, N.Y	4 75	5 00	5 25	5 00	....
Syracuse, N.Y.....	5 55	5 30	5 55	5 20	....
Oswego and Buffalo, N. Y	6 50	6 25	6 50	6 25	

Lehigh Furnace Lump $3 25, without any commission.

BITUMINOUS.

WHOLESALE PRICES. F. O. B.

Per ton of 2240 lb.

Broad Top.....	$6 75	Block House	6 75
Derby.....	6 75	Ohio Caking.....	10 00
Kittaning.....	6 75	Ohio Cannel.....	12 50
George's Creek, Cumberland.....6 75@7 25		Lyonsdale Coal.....	12 00
West Virginia Gas..7 40@7 50		James River Bit.....	6 50
Peytona Cannel	13 50	" Carb....	9 00
Penn. Gas.....7 50@7 65		*Cannelton Cannel....	12 50
Westmoreland Gas..7 50@7 65		Liverpool Gas Cannel, ex ship.....15 00@15 50	
Sterling Cannel.....	14 00	" House " ...	18 00
" " del'v'd.	16 00	‡Newcastle Gas....7 25@ 7 45	
Caledonia.....	6 50	Red Bank Cannel.....	9 00
Waverly Co. Youghiog'y.	7 50	†Cannelton Splint.....	9 00

Freight from Richmond, Va., to New York, $2 00.

* $11 f.o.b. at Richmond.

† $7 " " "

‡ Delivered at wharf.

RETAIL PRICES.

PER TON OF 2000 lb.

Liverpool House Orrel, delivered.....	$20 00@$22 00
Liverpool House, Cannel, delivered.....	.... @ 25 00
American and Block, delivered.....	16 00@ ——
Straitsville Cannel.....	16 00@ ——

	Grate and Egg.	Stove.	Chestnut.
Pittston Coal, in yard	$5 60	$5 80	$5 00
Delaware & Hudson, delivered.....	6 60	6 85	6 10
Scranton, delivered.....	6 75	7 00	6 25
Wilkesbarre, in yard.....	6 00	6 25	5 50
Lehigh and Locust Mountain, del'd	7 00	7 50	6 50

New York Wholesale Prices.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals						
Scranton.....	5 10	5 20	5 30	5 45	5 90	4 90
Lackawanna, Delivered on wharf.....	5 10	5 20	5 30	5 45	5 90	4 90
Pittston.....	4 95	5 00	5 10	5 20	5 70	4 85
Wilkesbarre	5 05	5 15	5 25	5 40	5 85	4 85
Newport & Plymouth	....	...	5 25	5 40	6 05	4 85
Susquehanna Coal Co.	5 25	5 35	5 40	5 55	6 00	5 00
Kingston.....	5 10	5 20	5 30	5 45	5 90	4 90
Lehigh Coals.						
Old Company.....	6 00	....	5 95	5 95	6 10	5 15
Old Co.'s Room Run.	5 50	...	5 50	5 50	5 85	4 85
Sugar Loaf	6 00	....	5 95	5 95	6 10	5 15
Hazleton	5 85	....	5 80	5 80	5 95	5 00
Honey Brook.....	5 85	....	5 80	5 80	5 95	5 00
Spr'g Mount. Coal Co.	5 85	5 85	5 80	5 80	5 95	5 00
Beaver Meadow.....	6 05	....	6 00	6 00	6 15	5 20
McNeal	5 85	5 85	5 80	5 80	5 95	5 00
Schuylk'l Coals. Alongside.						
Schuylkill W. A.....	4 95	5 05	5 15	5 30	5 75	4 40
Schuylkill Red Ash..	...	....	5 45	5 60	5 90	4 80
Shamokin W. & R. Ash	....	....	5 55	5 90	5 90	5 05
North Franklin.....	....	....	5 90	5 90	5 90	4 80
Lorberry	....	....	6 05	6 05	6 05	5 05
Lykens Valley.....	....	....	....	6 75	6 75	5 50

Georgetown, D. C., and Alexandria, Va.

George's Creek and Cumberland f.o.b. $4 35@$4 60, wholesale.

Buffalo, N. Y.

Youghiogheny Gas Coal..$6 00		Connellsville coke.....	8 00
Catlish Lump.....	4 75	Beaver Gas Coal.....	6 50
" Nut...	3 50	Red Bank Cannel.....	5 50
" Nut and Slack....	3 00	" Orrel.....	5 00
" Slack.....	2 85		

Anthracite, per 2000lb. in cars; retail prices, delivered $1 50 per ton additional.

Lump.....	$6 50	Stove.....	6 50
Grate.....	6 00	Chestnut.....	6 25
Egg.....	6 25		

Baltimore, Md.

Reported by E. STABLER, Jr., coal merchant.

WHOLESALE PRICES.

	afloat.	at depot.
Wilkes-Barre, "Lee," or "Diamond"		
Lump, steamboat or broken.....	$5 05	$5 60
Egg	5 35	5 75
Stove.....	5 45	5 75
Pittston and Plymouth.		
Lump, steamboat, and broken	....	5 35
Egg and stove	....	5 50
"Boston" (free burning,) all sizes.....	5 35	5 50
Shamokin, red or white ash, all sizes....5 35@5 60		5 50@5 75
Lykens Valley, red ash, all sizes.....	5 55	5 80

From wharf or yard, wholesale, 50@75c. additional.

By retail, all kinds and sizes, per ton of 2240 lb. $7@7 50.

BITUMINOUS.

George's Creek and Cumberland f. o. b. at Locust Point for cargoes.....	4 60@4 85
West Va. Gas Coal f. o. b. at Locust Point	6 50@....
Kanawha Cannel, coarse.....	13 00@....
Tyrone.....	7 25@....
Bitchie Mineral of West Virginia.....	19 00@....

Boston, Mass.

April 23, 1874.

Our market presents the same monotonous condition of the past few weeks, many of the wholesale houses alleging it to be even worse—the effort to sell being very great. With some, favorably situated, the low rates of freight are a temptation, and they are taking a limited advantage of the same. Stocks on hand are fair. The continued cool weather makes a moderate business for the retail dealers. In Cumberland the sales have been light, and none worthy of note. We quote:

English Cannel..$24 00@25 00		Pictou.....	8 25
do do from ship 22 00		Sydney.....	9 00
Scotch Cannel ....15 00@18 00		Acadia.....	6 75@ 7 25
American Cannel. 14 00@15 00		Cumberland	7 00@ 7 50
Lingan.....	7 50	Anthracite, retail .	8 50@ 9 00
Caledonia.....	7 75	" by cargo	6 75@ 7 50

Chicago, Ill.

April 20, 1874.

REPORTED BY RENO & LITTLE, COAL MERCHANTS.

No change in prices of coal. Trade extremely dull. We quote:

Lehigh Lump.....$11 00		Midway (West Va.)	8 00@ 8 50
Lehigh prepared..10 50@11 00		Cannel.....	9 00@10 00
Lackawanna, Wilkes-Barre and Pittston....	10 00	Blossburg.....	9 00
		Indiana Block.....	6 50
BITUMINOUS.		Hocking "Brooke".....	8 00
Briar Hill and Erie	8 00@ 8 50	Wilmington and Illinois..	5 00
Walnut Hill (W.V.)	8 00@ 8 50		

Cincinnati, O.

April 21, 1874.

Reported by A. BUCHANAN & Co., wholesale and retail dealers in coal and coke.

	Bush.	Tons.
Youghiogheny, or Pittsburgh, afloat... .....10 c.		$2 80
Pomeroy coal.....	7 c.	1 96
Cannel coal.....	18 c.	5 04
Semi Cannel	9 c.	2 52
The following are retail prices delivered:		
Youghiogheny..... .....13 c.@14c.		$3 64@$3 92
Pomeroy..... .....11 c.@12c.		3 08@ 3 36
Cannel..... .....22 c.@24c.		6 16@ 6 72
Semi Cannel..... —13c.		—— 3 64
Anthracite..... ——		—— 11 00

Cleveland, O.

April 22, 1874.

Our Cleveland correspondent writes:

The coal market at this point for all kinds of coal is exceedingly dull, and while producers and middle men are asking our quoted prices, something less is taken rather than loose an order.

There is some talk of a strike in the Mahoning Valley, which is rather encouraged by producers, inasmuch as they consider stock at Cleveland quite sufficient to supply demand for some time to come. Lake freights on coal by first fleet moving West are very low. Some vessel owners do not consider it of sufficient inducement, with low grain freight East, to fit out their vessels—Massillon coal covers Chippewa, Morris, Silver Creek, etc., etc. We quote:

	Per ton.		Per ton.
Youghiogheny, lump, f.o.b	$4 75	Straitsville	$3 50
Youghiogheny, nut	3 75	Columbiana.....	3 75
Briar Hill, (Church Hill)..	4 65	Strip Vein.....	4 00
" " (Brookfield)...	4 50	Mountain Blossburg, (blacksmith).....	6 00
Massillon, according to quality.....$3 75 to	4 00	Darlington and Sterling Cannel.....	4 60
Hocking Valley	3 75		

Denver, Col.

RETAIL PRICES.

Canon	$6 50	Boulder Valley.....	$4 75
Marshall.....	5 50	Eulner.....	5 50
Murphy.....	5 50	Black Diamond.....	5 50
Baker	5 00		

Detroit, Mich.

April 20, 1874.

Yard rates continue the same, with a fair demand for the season. We quote:

Lehigh Lump, per ton..	$11 00	Brookfield.....	8 50
Lehigh nut.....	10 00	Chippewa.....	8 00
Scranton, various sizes..	9 50	Massilon.....	8 00
Blossburg.....	9 00	Straitsville.....	5 00
Willow Bank.....	8 00	Nut.....	4 75
Briar Hill.....	8 50		

Indianapolis, Ind.

Per 2000 lb. WHOLESALE.		Per 2000 lb. WHOLESALE.	
Brazil Block.....	$4 25	Steam Nut.....	2 60
Highland.....	3 70	Hocking Valley.....	4 40
" steam.....	3 40	Gas Coke per bush.....	12 c.
Brazil nut.....	3 00	Pittsburgh	6 25
Slack.....	2 50	Sand Creek.....	5 00
Virginia Cannel.....	9 00	Anthracite.....	12 00
Indiana Cannel	7 20		

Louisville, Ky.

	Bush.	Tons
Pittsburgh, afloat.....	10 c.	$2 80
" retail	14 c.	3 92
Kentucky	11@13 c.	3 08@3 64
Indiana and Peacock Pomroy.....	13 c.	3 64@....
Anthracite, per ton, from yard.....	10 00@10 50	
" afloat	9 00@	

New Orleans, La.

April 18, 1874.

Reported by P. and R. DEVERGES, Wholesale and Retail Dealers in Pittsburgh, Anthracite and Cannel coal.

Stock large for the season, prices low, and demand moderate. We quote:

Pittsburgh coal, retail, per bbl	...75c.
" wholesale, per bbl	38@40c.
" per hhd	$7 00
" to steamboats, per box.....	50c.
" to manufacturers, per bbl..	60@65c.
Anthracite, retail, per ton	$12 50
" wholesale, per ton	$8 50@ 9 00
Spadra (Arkansas) coal, retail, per bbl.....	75c.

Omaha, Neb.

Blossburg(blacksmith).	$18 00	Wyoming.....	14 00
Anthracite	20 00	Missouri.....	8 00
Iowa.....	9 00		

Philadelphia, Pa.

ANTHRACITE.

Broken, in the yard.....	$5 50
Egg and Stove.....	5 75
Chestnut.....	4 75

BITUMINOUS.

Pennsylvania and Westmoreland Gas.....	6 25
Broad Top, f. o. b., Port Richmond.....	4 75@5 00
Red Bank Cannel.....	8 50
Clearfield Coal, f. o. b. at Greenwich, according to destination.....	4 75@5 00

75c. per ton additional for delivery.

Clearfield and Broad Top coals are about $6 25 per ton at South Amboy, f. o. b.

RETAIL.

ANTHRACITE.

P. & R. C. and I. Co., per ton of 2,240 lbs.†

	In Yard.	Delivered.
Broken.....	$5 50	$6 25
Egg and Stove.....	5 75	6 50@7 50
Chesnut.....	4 75	5 50@6 50

Other dealers generally ask a little more than the P. R. C. & I. Co., having special brands that are prepared in a superior manner.

BITUMINOUS.

Per ton of 2,240 lb.

$6@6 25 in yard; $6 75@7 00 delivered.

Pittsburgh, Pa.

April 21, 1874.

The following are the prices on cars here:

Youghiogheny	coal	per ton.....	2 25
"	coke	"	2 75
Connellsville	coal	"	2 25
"	coke	"	3 25
Anthracite all sizes		"	7 00

C stie Shannon coal on platform per bushel ..... 7½c.

San Francisco, Cal.

From the *Commercial Herald*, April 9, 1874.

Supplies of bituminous coal from Vancouver Island are increasing. This is a decided favorite with gas and other large consumers, and finding ready sale at all times. The supplies

from Black Diamond and other Mt. Diablo mines are quite liberal. Australian is plentiful, both present and prospective, and for this, low prices prevail. Anthracite is scarce and high. Cumberland is in good stock, with considerable competition among dealers. The receipts at this port from Jan. 1st to April 1st, were 99,216 tons; showing a decrease of 9,598 tons, as compared with the same time last year. The increase in the receipts of domestic coals, amounts to 4,068 tons; Australian 2,236 tons; and Vancouver Island, 8,586 tons. The receipts of English coals decreased 20,044; Anthracite, 3,358 tons; and Cumberland, 1,086 tons. We quote:

West Hartley	$13 00	Bellingham Bay	8 50
Wallsend	12 00	Mt. Diablo, coarse	8 50
Australian	10 00@11 00	" fine	6 25
Coos Bay	10 00	Anthracite	20 00
Nanaimo	11 50	Cumberland	18 00@20 00

St. Louis, Mo.

April 18, 1874.

The receipts by rail at East St. Louis for March were 5,959 cars, or about 60,000 tons. The receipts from the 1st to the 8th inclusive were 1,659 cars, or about 16,590 tons.

Delivered in St. Louis 4 cents per bushel extra.

Delivered to railroads and mills by car ferry 2c. per bushel extra.

	Per bushel.	Per ton.
Illinois coal, retail at East St. Louis	9 c.	$2 52
" " manufacturers	8 c.	2 24
" " delivered	12 c.	3 36
Big Muddy	13½ c.	3 78
Trenton	11¼ c.	3 22
O'Fallon	9 c.	2 52
Anthracite, delivered in St. Louis		$13 50
Missouri cannel, " "		6 50
Indiana cannel		7 00

Toledo, Ohio.

Scranton, all sizes	$9 00	Briar Hill	6 00
Lehigh Lump	11 00	Bituminous	4 50@6 50
Blossburg	8 50@ 9 00		

Halifax, N. S.

Prices in gold, per ton of 2240 lbs.

Sydney Coal	$8 00	Little Glace Bay	7 75
Victoria		Albion (at Cunard wharf)	7 50
Gowrie	7 75		

Toronto, Ont.

Prices in gold, per ton of 2000 lbs.

Scranton, all sizes	$7 50	Bituminous	7 50
Lehigh prepared	8 50	Blossburg	7 00
" Lump	9 00		

Montreal, Queb.

Prices in gold, per ton of 2000 lb., ex yard.

Scotch Steam	$8 00@ 8 50	Lump Lehigh	9 00@— —
Lower Port	7 50@ 8 00	Grate	10 00@— —
Newcastle Grate	11 00@12 00	Egg, Amer. Ant	9 50@10 00
Welsh Anthracite	9 00@10 00	Stove, "	10 00@10 50
English Coke	—@— —	Chestnut "	10 00@10 50

Provincial Coals.

PRICES IN GOLD F.O.B. AT THE SHIPPING PORTS OF THE MINES.

	Coarse.	Slack.		Coarse.	Slack.
Block House	$2 25	$1 25	Sydney, Reserve mine	2 60	....
Gowrie	2 00	1 50	Lingan	2 30	....
Pictou, Albion mine	3 00	....	Caledonia	2 00	....
Pictou, Vale m.	3 00	....	Glace Bay	2 00	....

Freights from Cape Breton to New York remain at $3 25.

TOWING

FROM NEW YORK TO POINTS ON THE HUDSON RIVER.

	per ton.		per ton.
Manhattanville	8 c.	Haverstraw	17 c.
Spuyten Duyvel	9 "	Verplanck's Point	17 "
Yonkers	10 "	Peekskill & Newburg	18 "
Hastings	11 "	West Point & Cold Sp'g	20 "
Piermont & Dobbs Ferry	13 "	Poughkeepsie	22 "
Nyack & Tarrytown	15 "	Rondout	23 "
Sing Sing	16 "	Hudson	25 "
Croton Landing	17 "		

Boats of 100 tons and under—per boat.

Manhattanville	$11 00	Spuyten Duyvel	$13 00
Yonkers	15 00	Tarrytown	18 00
Sing Sing	20 00	Peekskill	20 00
Newburgh	25 00	Poughkeepsie	30 00

ON LONG ISLAND SOUND.

	per ton.		per boat.
Norwalk & Bridgeport	33⅓ c.	Port Morris	$20 00
New Haven	33⅓ "	West Farms, mouth of Creek	25 00
Derby ($50 per b't extra)	33⅓ "	West Farms	35 00
Southport & Westport	40 "	West Chester	30 00
Milford	40 "	College Point	25 00
Branford	45 "	Flushing & White Stone	30 00
New London	60 "	East Chester Town Dock	60 00
Middletown	65 "	New Rochelle & Glen Cove	50 00
Norwich	68 "	Mamaroneck & Port Chester	70 00
Hartford & Stonington	75 "	Greenwich, Stamford & Darien	75 00
Mystic	75 "		
	per boat		
Harlem	$18 00		
Mott Haven	18 00		

Harbor Towing.

From Hoboken to

	Loaded.	Light.
23d st., towing limits	$6 00	$5 00—$11 00
Gowanus	8 00	6 00— 14 00
Newtown Creek	10 00	9 00— 19 00
Port Johnston	9 00	9 00— 16 00
130th street, North River	....	....— 18 00
From East River to Weehawken and return to East River	9 00	7 00— 16 00

To 61st st., $12 extra; to 79th st., $14 extra; to 93th st., $16 extra.

Lehigh and Delaware Division Canals.

MAUCH CHUNK, PA., March 25, 1874.

Until further notice the following rates of toll, via the above canals will be adopted.

From Mauch Chunk to Easton per ton of 2240 lb..... 46c.
" " " " Bristol or New Hope..... 70c.
Towing from Bristol to Philadelphia..... 9c.
On local shipments the toll sheets of 1873 will remain in force

Erie and Champlain Canals.

The following rates represent the figures at which orders are taken for shipments upon the opening of the above canals, which will be on May 5th.

NEW YORK AND SHIPPING POINTS IN THE VICINITY TO

* Buffalo and Lockport	$1 85	* Utica, N. Y	1 25
* Rochester	1 75	* Syracuse, N. Y	1 35
* Burlington, Vt	1 75	*Oswego, N. Y	1 70
Albany	85	Troy	90

* Alongside.

*Montreal, Canada, gold.	$2 75	Ottawa, Canada	3 25
St. Johns, N. B	2 50	Quebec	3 25

* Harbor towing extra

Chesapeake and Ohio Canal.

BITUMINOUS COALS.

The freight on George's Creek coal per ton of 2240 lb. to Georgetown is $1 86. To Alexandria, Va., it is 11c. per ton more. By the B. & O. R. R. to Baltimore the freight on George's Creek coal is 2.70 per 2000 lb., and 4c. per gross ton for use of cars.

On bituminous coal from Cannelton to Richmond via the C. & O. R. R. the transportation amounts to $3.65 per net ton.

We are compelled to omit, for want of space, our table of freights from the Mines to the *sea ports*; they are, however, unchanged.

Freights.

PORTS.	From Baltimore and Georgetown.	From Port Richmond, Philadelphia.	*From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me	3 50	....	....
Albany	2 25	....	....
Amesbury, Mass	....	....	....
Bangor, Me	3 25	2 50	....
Bath, Me	2 50	....	....
Baltimore	....	....	....
Boston, Mass	2 50	2 25	1 80
Bridgeport, Ct	2 10	1 50	85
Bristol, Ct	....	1 90	1 20
Derby	....	1 50	1 15
Dighton	....	....	....
East Cambridge	....	....	††1 80
Fall River	2 10	1 90	1 20
Hackensack	....	....	....
Hartford	2 75	....	1 40
Hoboken	....	95	40
Hudson	2 20	....	....
Jersey City	1 75	95	40
Middletown	....	....	1 25
Mystic	....	....	1 15
Newark	1 90	....	....
New Bedford	2 15	1 75	1 25
Newburyport	2 75	2 50	2 05
New Haven	2 10	1 50	85
New London	2 20	1 65	1 10
Newport	....	1 75	1 20
New York	1 90	¶ 95	§ 40
Norfolk	90	....	....
Norwalk	2 25	1 50	85
Norwich	2 25	1 50	1 15
Pawtucket	2 50	1 90	‡‡1 30
Philadelphia	1 10	....	....
Portland	2 50	3 00	1 75
Portsmouth, N. H	2 60	2 60	2 00
Providence	2 10	1 75	1 20
Richmond, Va	....	....	....
Rockport	....	2 70	....
Saco	....	3 00	....
Sag Harbor	1 25	....	1 10
Salem	2 75	2 50	1 85
Stamford	....	1 50	85
Stonington	....	1 75	1 20
Taunton	....	....	1 65
Troy	2 30	....	....
Warren	....	....	1 20
Washington	....	....	....
Wareham	2 50	....	1 50
Wilmington, Del	1 10	....	....

Rates from Rondout to New York 15c. above Weehawken. They are 5c. less from Newburgh going south, and 5c. above Newburgh rates going north.

§ Under 150 tons, 50c. per ton.

¶ This is the rate alongside. Delivery on wharf costs from 16c. to 18c. additional.

†† Towing extra.

‡‡ 3c. per ton per bridge extra.

* Freights from South Amboy are 5c. above these rates, and from Hoboken and Weehawken about 5c. less.

Freight on Pittston Coal—From Newburgh.

By boats of the Pennsylvania Coal Co., per ton of 2240 lbs.

To Troy, Albany and Stuyvesant	60 c.
" Nyack and Hudson and Boston R.R. dock, Hudson, discharged to cars	50 c.
" Hudson, except as above, Rondout and Poughkeepsie	35 c.
" Catskill, at mouth of creek, Sing Sing, Tarrytown, Piermont, and Yonkers	55 c.
" Fishkill Landing and West Point	25 c.
" Peekskill, Haverstraw, Saugerties, and Barrytown	45 c.
" New York	65 c.

MISCELLANEOUS FREIGHTS.

Gas Coals.

From Fairmont and Clarksburg, via B. and O. R. B., to Baltimore, including loading	$5 20
From Coalburg and Paint Creek to Richmond, via C. and O. R. R., per ton, including loading	3 75
From Richmond to New York	2

Delaware and Raritan Canal.

TOLLS AND TOWING.

Per ton of 2240 lb.

From New Brunswick to	cents.	From New Brunswick to	cents.
South Amboy, towing only	10	Newark, towing only	20
Rahway, " "	13	Hudson City, "	25
Elizabethport, " "	15	New York, below 23d st.	20

Canal tolls on anthracite from New Brunswick is 25 cents extra.

Canal tolls on bituminous from New Brunswick is 37 cents extra.

Towing from Port Richmond, 7 cents additional.

Fairmount to New York, including tolls	57 cents.
Greenwich " " "	64½ "
Trenton " " "	35 "
Port Richmond " anthracite,	52 "

Tolls on bituminous, loaded at Port Richmond and Greenwich, is 12½ cents per ton extra; other bituminous and semi-bituminous, 25 cents extra.

IRON MARKET REVIEW.

Import Duties.

The following are the duties in Gold on Iron:

Flat iron, not less than 1, nor more than 6 inches wide, nor less than ⅜, nor more than 2 inches thick. *Round Iron*, not less than ¾, nor more than 2 inches in diameter, and *Square Iron*, not less than ½, nor more than 2 inches square ₰ lb. 9-10 of 1c.

Flat Round or Square Iron, of larger or smaller sizes than the above mentioned, per lb..... 1 35-100c

Provided, that all iron in slabs, blooms, loops, or other forms, less finished than bars, and more advanced than pig iron, except castings, shall pay the same as iron does.

Provided, that none of the above iron shall pay less than 31½ per cent.

Railroad Iron	63c. per 100 lb.
Boiler plates, or other plate iron not less than 3-16 of an inch thick, per lb	1 35-100 c.
Scrap castings per ton	$5 40
" wrought " "	7 00
Pig Iron per ton	6 90

Iron ore 10 per cent. *ad valorem*.

New York.

April 24, 1874.

Although business in this city is almost invariably reported very dull, yet, there appear to have been more transactions than during the previous week. Now, that inflation is dead, the policy of the administration known, and the long desired "*something*" has been done, it is to be hoped that confidence will soon be re-established, and that the manufacturing interests will soon be benefited by a portion of the large sums of money now being hoarded. The feeling still prevails that it will take some time to make business move, but that when it does it will be very brisk.

American Pig.—The consumptive demand is very light, and the prospects of the immediate future are not very encouraging. There have been no speculative transactions of late. The best brands of Lehigh are firmly held at $35 for No. 1; $33 for No. 2, and $31 for gray forge, at which figures there is no profit, as we were plainly shown from the books of one of the best managed Lehigh companies. These figures can be considerably shaded on brands not so well established, and according to the financial necessities of the furnace companies. We learn of sales of 750 tons gray forge, at $27; 750 tons ditto, at $28; 500 tons ditto, at $27.50, and 500 tons ditto, at $27. There is not a heavy stock of gray forge in Eastern Pennsylvania. We quote:

No 1, Foundry Anthracite	$34 00@35 00
No. 2, " "	31 00@33 00
Grey Forge	27 00@30 00
White and Mottled	22 00@26 00
Salisbury Charcoal Carwheel	62 00 ....

Scotch Pig.—The strikes in Scotland are supposed to be about at an end. Our cable information is somewhat conflicting. We received quotations for Wednesday as follows: Coltness, 91s. 6d. and 92s. 6d.; Gartsherrie, 86s., 87s. and 88s.; Glengarnock, 86s. and 87s.; Eglinton, 76s. and 77s.—76s. is undoubtedly the correct figure for Eglinton, as we have been able to check it by a telegram dated 19th inst., giving a decline of 4s., and another 22d inst., giving 3s. advance, equivalent to a decline of 1s. since the 18th. The demand is light, consumption limited, and stocks not large. There is not supposed to be much afloat. From one large dealer we receive information that there is more inquiry. We note sales of 200 tons Eglinton in lots, at $36.60@37: 100 tons Glengarnock at $38; 150 tons Coltness, on private terms; 200 tons mixed brands, in lots, at our higher quotations; 100 tons Carnboe; 100 tons Langloan; and to arrive, 200 tons Coltness, all on private terms. We quote: Eglinton, $36@37; Coltness, $39, to arrive, and $42@42.50 on spot: Glengarnock, $37@38; Carnbroe, 36.50@37; Langloan, $3@738; and Summerlee, $38.

Iron Rails. This branch of business is still very dull, and in the absence of prices to transactions, our quotations are merely nominal. There are occasionally lots of both English and American rails offered at very low figures, by parties who must realize. We learn that such was the case with a lot of English during the past week. We note sales of 600 tons 30 lb. rails for a Western road, for cash, figure not given; and 1000 tons 56 lb., particulars private. There were rumors of the sale of 1500 tons, but we were unable to confirm it. We quote American at $58@$60, currency, at the works, and English at $54@$55 gold.

Bessemer Steel Rails. In the absence of transactions we quote nominally: English $92@$95, gold; American, $98 @100 currency.

Old Rails. We learn of no transactions and quote: T's at $39@$40, upon which figures concessions can be had on large orders for prompt cash.

Scrap Iron. We learn of sales of 250 tons of wrought scrap at $42.50; 100 to 150 tons scrap steel at 2¾c., and 350 tons wrought scrap on private terms. We quote: wrought at $40@$42.50, according to quality; and cast at $28@$32.

Baltimore,

April 20, 1874.

The sales for the past week have been unimportant, and the market remains very dull. We quote No. 1 American Anthracite pig at $33; No. 2, $31, and No. 3, $29.

Chicago,

April 22, 1874.

ROGERS & Co., dealers in Scotch and American pig iron, report the market as follows:

The market is quiet, not much doing. The large buyers are out of the market, having purchased, during the past month, from 3 to 6 months' stock. We quote at 4 months' time:

No. 1 Coltness	$48 00@ ....
No. 1 Gartsherrie	47 00@ ....
No. 1 Summerlee	46 00@ ....
No. 1 Glengarnock	45 00@ ....
No. 1 Eglinton	44 00@ ....
Warner's "American Scotch"	43 00@ ....
No. 1 Grand Tower Mo. ores (Bituminous)	38 00@ ....
No. 2, " " "	33 00@ ....
No. 1 Forge	30 00@ ....
Union "A" 1 (Anthracite)	35 00@ ....
Union "B" 1 (Anthracite)	34 00@ ....
No, 1 Lake Superior (charcoal)	43 00@ ....
No. 2 Lake Superior "	40 00@ ....
No. 3 Lake Superior "	43 00@45 00
No. 4 Lake Superior "	45 00@48 00

Cincinnati.

April 21, 1874.

Reported by TRABER and AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

The market for pig iron continues very quiet, and we have nothing of interest to report. Good brands of charcoal foundry are scarce. Other kinds are in abundant supply. Nothing doing in cold blast. We quote:

CHARCOAL.

Hanging Rock, No. 1, Foundry	$38 00@39 00—4 mos
" No. 2, "	35 00@36 00—4 mos
" Mill	32 00@ ....—4 mos
Tennessee No 1, Foundry	36 00@37 00—4 mos
Tennessee. No. 2 "	34 00@35 00—4 mos
" Mill	31 00@32 00—4 mos
Missouri, No. 1, Foundry	38 00@40 00—4 mos

STONE COAL.

Ohio No. 1, Foundry	35 00@37 00—4 mos
" No. 2, "	33 00@34 00—4 mos
Ohio Mill	30 00@31 00—4 mos
Missouri, No. 1, Foundry	35 00@37 00—4 mos
" No. 2, "	33 00@34 00—4 mos
" Mill	30 00@31 00—4 mos

CAR-WHEEL.

Hanging Rock, C. B.	58 00@60 00—4 mos
Tennessee "	55 00@57 00—4 mos
Missouri "	55 00@57 00—4 mos
Alabama "	55 00@57 00—4 mos

BLOOMS.

Charcoal	85 00@100 00—cash

SCRAP IRON.

Cast	1 00@ 1 25—cash
Wrought	1 40@ 1 75—cash
New hails	63@ 65—cash

Cleveland

April 21, 1874.

C. E. BINGHAM & Co., dealers in pig iron and iron ores, report the market as follows:

Our pig iron market has become firmer since our last report, and the demand has increased, although prices have remained unchanged. We quote as follows:

No. 1, Anthracite Foundry	$33 50@34 50—4 mos
No. 2, " "	31 50@32 50—4 mos
No. 1, Bituminous "	34 00@35 00—4 mos
No. 2, " "	32 00@33 50—4 mos
No. 1, Grey Forge Bituminous	29 00@30 00—4 mos
No, 2, Close Grey	28 00@29 00—4 mos
No. 1, Massilon Black Band	36 50@37 00—4 mos
No. B-1 " "	34 50@36 00 —4 mos
No. 2 " "	33 50@34 50—4 mos
No. 1, Lake Superior Charcoal	41 00@42 50—4 mos
No. 2, " "	39 00@41 00—4 mos
No. 3, " "	44 00@46 00—4 mos
Nos. 4, 5, 6, " "	47 00@52 00—4 mos
American Scotch	34 00@35 00—4 mos

Detroit.

April 21, 1874.

Scotch pig, net	$46 00@ ....
Lake Superior pig, No. 1	44 00@ ....
" " No. 2	42 00@ ....

Louisville.

April 21, 1874.

GEORGE H. HULL reports the market as follows:

The market is quiet but steady. There is no immediate prospect of the mills resuming work. and forge irons are not salable at quotations. Foundry and car wheel irons are in moderate request to supply immediate wants.

The usual time, 4 mos., is allowed on the quotations below:

HOT BLAST—CHARCOAL.

No. 1 foundry, from Hanging Rock ores	$38 00@40 00
No. 2 " " "	34 00@36 00
No. 1, forge, " "	31 00@32 00
No. 1, foundry, " Tennessee "	35 00@40 00
No. 2 " " "	33 00@35 00
No. 1, forge, " "	30 00@31 00
No. 1, foundry, " Alabama "	35 00@38 00
No. 1, " " Iron Mountain "	41 00@43 00

HOT BLAST—STONECOAL.

No. 1, foundry, from Missouri ores	34 00@36 00
No. 2, " "	32 00@33 00
No. 1, forge " "	30 00@31 00

COLD BLAST—CHARCOAL.

Car Wheel from Hanging Rock ores	60 00@63 00
" " Tennessee "	53 00@55 00
" " Alabama "	55 00@57 00
" " Georgia "	55 00@57 00
" " Missouri "	53 00@57 00
" " Kentucky "	55 00@57 00

Philadelphia.

April 23, 1874.

The prospect looks better, and there is a little better feeling in the iron market. The inquiry is somewhat greater than at the date of our last. Forge irons in Eastern Pennsylvania are rather scarce. We note sale of 1000 tons gray forge at $28, and small sales of mixed brands at our regular quotations: also 500 tons of new rails at $62.50, and 1000 tons old, at $41.50 in this city. We quote No. 1 pig, at $33 to 35; No. 2, $31 to 33, and gray forge at $29 to 30. New rails are quoted at $58 to 60 at the works, and old at $41 to 42 here. No. 1 wrought scrap is quoted at $39 to 41.

Pittsburgh.

April 23, 1874.

Reported by A. H. CHILDS, commission merchant for the sale of pig iron, blooms, ore, &c.:

The market continues well supplied with good brands of pig iron, and prices remain unchanged. The demand is perhaps a trifle less active than at the time of our last report, but the general impression seems to be that any change in prices is more likely to be in the direction of an advance than towards lower figures. It may be proper to add, however, that a puddlers' "strike" is threatened. Should this occur and become general, the aspect of affairs would be materially changed. We quote:

No. 1 Foundry, anthracite or bituminous	$32 00@34 00—4 mos
No. 2, " " "	30 00@31 00—4 mos
No. 1, Grey Forge, " "	27 50@29 00—4 mos
No. 2, " " "	27 00@ ....
White and mottled " "	26 00@26 50—4 mos

The Pittsburgh *Commercial* reports the following sales for week ending April 10th:

IRON MADE FROM LAKE SUPERIOR ORES, SMELTED BY BITUMINOUS COAL.

500 tons gray forge,	$27 00—cash.
200 tons " "	26 00—cash.
500 tons gray forge, neutral	27 00—4 mos
100 tons white and mottled, neutral	26 00—4 mos
100 tons foundry	29 00—cash.
100 tons No. 2 foundry	28 50—cash.
100 tons gray forge, neutral	28 00—4 mos
60 tons foundry	30 00—cash.
30 tons foundry	30 00—4 mos

ANTHRACITE.

10 tons No. 1 foundry	$35 00—4 mos

San Francisco.

April 9th, 1874.

The demand for pig iron is inconsiderable, and prices entirely nominal. Scotch pig of standard quality is now freely offered for delivery next fall and winter, at $40, and yet there are no buyers at present. Last sale of Glengarnock at $41.

St. Louis, Mo.

April 18, 1874.

The receipts of pig iron for the week ending the 12th inst. were 837 tons, and the shipments 550 tons. The receipts of iron ore were 4,900 tons, and the shipments 310 ton. The shipments on the St. Louis, Salem and Little Rock Railroad for the same time amounted to 2020 tons, showing an increase of 770 tons over the previous week. The following are the quotations:

HOT BLAST STONE COAL PIG.

No. 1 foundry from Iron Mountain and Maramac ores,	$32@34
No. 2 foundry from Iron Mountain and Maramac ores,	29@31
No. 3 forge from Iron Mountain and Maramac ores,	25@29
No. 1 Massilon,	43@..
No. Tennessee, col d short,	36@..
No. Ohio, cold sho rt,	40@..

HOT BLAST CHARCOAL PIG.

No. 1 foundry from Iron Mountain and Maramac ores,	35@40
No. 2 foundry from Iron Mountain and Maramac ores,	34@36
No. foundry from Tennessee ores,	35@37
No. forge from Tennessee ores,	31@33

COLD BLAST CHARCOAL PIG.

Hanging Rock car wheel,	60@64
Tennessee,	58@60

MISSOURI IRON ORES.

Iron Mountain Co.'s Quotations.

Iron Mountain, per ton	$8 00
Benton Creek, "	7 50
Surface ores, "	8 00
Red and brown hematites, per ton	5 00@6 50
Pilot Knob, per ton	5 50
Rails, 50 to 60 lb. inclusive	66 00@69 00

THE BRITISH IRON TRADE.

LONDON, April 4, 1874.

Perhaps at no period have the iron markets been more deranged than at the present time, owing to the extreme uncertainty which pervades the trade in all its branches. With but few exceptions, the actual prices, though not excessively high, are yet sufficiently so to deter buyers from coming forward. The strikes of the miners, and the scarcity of orders have been the causes of many furnaces being damped down and the suspension of operations at many mills and forges; yet we still learn of considerable pig iron going to stock.

In the South Staffordshire district there are about 17,000 miners on strike, and unless it be terminated, the iron works must for the most part be closed; 27 furnaces are being damped down or blown out already. The merchants in this district have been forcing sales of bars at £11, while Belgian bars are delivered at £10 10s. In North Staffordshire the finishing iron trade is very depressed, and mills and forges are stopping for want of orders. There is hardly anything doing on either foreign or home account. The North of England trade has been very much unsettled by the failures of Messrs. Watson, Campbell & Co., and Messrs. Hannay & Sons. The business on Change was in a very excited state, and it is stated that forged pigs had been offered as low as 54s., net cash. Rail makers are only able to secure orders by making concessions. The iron-masters propose a reduction of 20 per cent. in wages, which will likely be settled by arbitration as in most cases heretofore in this district. The quarterly meeting of the North of England iron, coal and allied trades, will take place next Tuesday in the Exchange, Middlesbrough. In Shropshire the iron and coal masters have resolved to reduce miners wages 6d. per day, and enginemen 2d. per day; iron to be reduced £1 per ton, and coal 2s. 6d. per ton. The Bessemer Steel Works are all quite busy and some large orders are being turned out for Russia and other places. The crucible steel business is not in so satisfactory a state.

In Wales only small and necessary orders are being given for iron. Iron making with but very few exceptions is being carried on at a loss. Masters are, however, hopeful of a brisk trade as spring opens out. The exports of rails last week show a slight improvement. The masters have postponed a discussion of the labor question, so there will probably be no trouble from that source, before they again meet, at the end of this month.

Makers in Cleveland will gladly sell No. 1 pig, at 65s.; No. 2, at 62s.5d.; and No. 3, at 60s. In Durham the general figure for No. 3 pig, is 60s., and No. 4, 56s.. No. 4 Pig is being delivered into the Manchester district at 72s.6d. Rails are being quoted in the North of England at £9@£10, about the former figure being the most general.

Scotland.—An early adjustment of the labor troubles is looked for. Some of the miners have intimated their willingness to submit to a reduction of 20 per cent., but the masters have shown their unwillingness to put their blasts in operation till they are better assured that the employees are willing to attend to their work, and work six days in the week. Mr. MCDONALD condemns the action of the miners in not adopting Mr. FERRIE'S sliding scale, which he considers a panacea for all their troubles; but, in some cases this would make a reduction of 3s. per day and in others of 25 per cent. In the East of Scotland everything is working smoothly. The strike against 1s. per day in Mid-and East Lothian has collapsed, the men being beaten.

During the past week business was done in the Warrant Market from 77s.6d. to 83s.6d.; closing April 1st at 79s.6d The failures of Messrs. Watson, Campbell & Co., and Messrs. R. Hannay & Sons, have had a very disastrous effect on the iron business. They were not brought on by losses in legitimate business; but, by speculating on a falling market. The liabilities of the former firm amount to £324,475 and the assets to £58,398, or about 3s.6d. in the £. The latter firm is said to have liabilities amounting to £800,000. It is confidently affirmed (even among the creditors) that the estate will realise 12s.6d. @13s. in the £. The shipments of pig iron for the week ending March 28, show a decrease of 566 tons as compared with the corresponding week in 1873 and a total decrease for the year, amounting to 41,551 tons. The imports of Middlesbrough pigs into Grangemouth show an increase for the same time of 2,180 tons and a total increase for the year of 16,697 tons.

Makers' irons are very irregular, but the following are approximate quotations: Gartsherrie No. 1, 90s.; Coltness, 92s.6d.; Summerlee, 90s.; Carnbroe, 86s.; Glengarnock, 87s.6d.; Eglinton, 82s.6d.; and Carron, 90s.

METALS.

NEW YORK, April 24, 1874.

Gold Coin.—During the last week gold has ranged from 114⅛@112⅜, and closed, yesterday, at the latter figure.

Bullion.—Owing to the scarcity of silver bar in this market, and the prospect of but very little arriving for two or three weeks, on account of not being able to transport from the mines until the roads improve, there has been a slight advance, and it is now quoted at $1.28@1.29, gold, per ounce. Fine gold bar is quoted at par ($20.67 gold, per ounce), to ⅛ per cent. premium.

Copper.—During the past week, sales on spot have amounted to about 50,000 lb., at 24¾c., and business is looking up. We learn of the sale of 200,000 lb., to be delivered in June, at 24¾c. Chili is quoted in London at £76.

Tin.—By the latest cable quotations, we learn that L & F is quoted in London at £107, and Straits £106, with small stocks. The strike in Wales continues. The reaction in Europe has had a corresponding effect on this market, and prices are steadily advancing. Straits are now being held at 25c.; English Refined, 23⅛; and L. & F., 22⅛c., all gold. We note sales of about 4,000 slabs Straits, at 24c.@25c. gold, of which 2,000 slabs were sold at 24@24⅛c., and 500 to arrive, at 24¾c., gold: also, 50 tons L. & F., 21¾c.@22⅛c., gold, and 20 tons 21⅛c.@21¾c., gold.

Lead.—The market is dull, and sales are in moderate quantities for consumption. The stock is very light, and concentrated in a few hands. There is no bullion, worthy of mention, moving eastward. We note sale of 30 tons of Domestic at 6¼c., gold, and quote to-day at 6⅛c.@6¼c., gold. Foreign is quoted at 6⅝c.@6¾c., gold.

Spelter.—The business is very light. We note sale of 25 tons Silesian at 6¾c., and quote to-day at 6¾c.@7c., gold. Missouri is being quoted at 7c.@7¼c., currency.

Zinc.—The market for Mosselman sheet is firm at 8¼c.@8⅝c., gold. We note sale of 40 casks at $8.56, gold, per one hundred pounds. Western is quoted at 8¼c., currency, and Silesian 8¼c.@8⅝c., gold.

Antimony.—The market is quiet, and prices remain the same as at the date of our last, viz: 12¾c.@12¾c., gold.

Manganese.—Common hard, or Psilomelane is in full supply at 3½c. per lb.; soft or Manganite 5c.; and crystallized, or Pyrolusite scarce at 6c.@7c.

Quicksilver.—The demand continues to be beyond the supply, and prices here remain unchanged, while in London they are advancing. The quotation in London, 4th inst., was £19 15s.@£20 per bottle. The quotation here is $1.33@$1.35 per lb., and in San Francisco $1.25 per lb.

San Francisco Stock Market.

BY TELEGRAPH.

New York, April 23, 1874.

We have advices from the San Francisco Stock Board dated the 21st. With the exception of a slight decline in Kentuck and Raymond & Ely, the market has advanced. The report is as follows:

Savage	66	Imperial	6
Crown Point	87	Raymond & Ely	20½
Yellow Jacket	84	Meadow Valley	9
Kentuck	17	Eureka V G	9½
Chollar Potosi	64	Ophir	—
Gould & Curry	25	Hale & Norcross	—
Belcher	82		

Boston Stock Market.

Boston, April 22, 1874.

The following represents the prices bid for copper stocks at the closing of the Board. 150 shares of copper, Falls Mining Co., sold at from $21.25 to $22.

Allouez	7¾	Pewabic	8
Calumet and Hecla Co.	135½	Phœnix	15
Copper Falls	22	Quincy	35½
Central	25	Ridge	5¾
Franklin	3½	Rockland	1
Mesnard	1	St. Clair	2
National	3⅞	Star	1¾
Petherick	2½		

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The Engineering and Mining Journal, which is the Organ of the Institute, and contains its proceedings, transactions and notices of meetings, will be sent to each Member and Associate on the payment of his annual dues. Back numbers cannot, as a rule, be sent.

II. Dues (ten dollars per annum) are payable on election and at the annual (May) meeting. Members and associates elected at the February meeting pay ten dollars only to May of the following year. Remittances should be made, as far as possible, by P. O. Order, payable to the Secretary.

III. The Council earnestly requests members to forward to the Secretary, for preservation, copies of all printed mining and geological reports, particularly pamphlets, which may fall in their way. It is believed that by this means a large amount of valuable fugitive information concerning different regions and properties in this country, may be caught and preserved.

Thomas M. Drown, Secretary, 1123 Girard street, Philadelphia, Pa.

125th Auction Sale.

50,000
TONS SCRANTON COAL.
On WEDNESDAY, APRIL 29th, 1874.

New York, April 22nd, 1874.

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The sale will be positive; each lot put up will be sold to the highest bidder; no bids, in any form whatever, being made for account of, or on behalf of the Company. The conditions will be fully made known at the time of sale.

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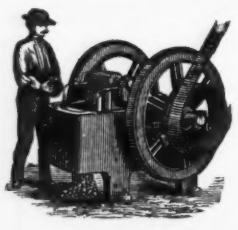

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